THE

AMERICAN REPERTORY

OF ARTS, SCIENCES, AND MANUFACTURES.

No. 3.] NEW-YORK, OCT. 1841. [Vol. IV.

ENGINES OF WAR.

Refinement upon refinement in the art of destroying our species follow each other so rapidly, that we hardly have time to chronicle one, before another springs up to throw it into the shade. But a short while since, and the paixham gun was thought to be the perfection of destructive weapons; and now we have to note some two or three inventions that will make Capt. Paixham, if not his gun, blush from very shame of mercifulness. Battles by sea hereafter will rival the fabled conflicts of the gods, when, to heighten the dread accompaniments of warfare, *the sea boiled up*, and the combatants were enveloped in mist and hot steam.

One of the most terrible of these promoters of peace is the projectile whose destructive properties were so vividly set forth in an extract from the London Times, which lately appeared in our pages, describing an experiment performed with it in the presence of several magnates of science and rank. The inventor, who, it has since appeared, is a Mr. Warner, has been endeavoring for ten years to get the British Government to examine his invention fully, and if meritorious adopt it, but without success, although his statements as to its power were strengthened by the testimony of several scientific gentlemen to whom he had communicated the secret, who unhesitatingly pronounced

the invention of such importance that it would make that nation which might first adopt it, mistress of the seas. This declaration, though forcible, was in a great degree justified by the public trial afterward made of it, some of the results of which we again insert:—"A boat 23 feet long and 7 broad, filled in with solid timber $4\frac{1}{2}$ feet in depth, crossed in every direction, and clamped together with 8-inch spike nails, was placed in a large sheet of water: at a given signal set in motion and struck [by the projectile] just abaft the starboard bow, when she instantaneously scattered into a thousand fragments. At the moment of collision, the water parted and presented the appearance of a huge bowl, while upon its troubled surface there was a corruscation resembling forked lightning: a column of water was lifted into the air like a huge fountain, and from it were projected the shattered fragments of the vessel, many of which fell in the adjacent fields, and at a distance of several hundred yards: the huge nails had snapped like carrots, and the mast looked like a tree riven by lightning. * * * * The inventor asserted that these tremendous powers, were completely under his control; that the instrument that had thus lifted into the air a boat weighing $2\frac{1}{2}$ tons, besides displacing about 15 tons of water, weighed only 18 pounds, and might without danger be kicked round a room when charged with its deadly contents." Some doubts might reasonably be entertained of the accuracy of this account; but Lord Ingestre, who had witnessed the experiment, upon being appealed to in the House of Commons, when the matter was subsequently brought up there for discussion, declared that the statement in the Times was perfectly true; and although he regretted that such publicity had been given to the invention, which, he thought, ought to have been secured to the country in the most secret manner possible, he was decidedly of opinion that it was the most important discovery of modern times for purposes of warfare.

After such an evidence of its power, this invention became very naturally the subject of many speculations in the European journals. With a single exception, those that have come under our notice do not possess any extraordinary interest. This exception is an article in *Le Fanal*, a Belgic paper, which em-

bodies several suggestions and remarks so well suited to our national wants and condition, that we give a transcript of it entire. It will be seen that an explanation of the actual nature of Mr. Warner's invention is ingeniously avoided, by describing one that the writer believes is much more terrible in its effects, but which to us appears of very doubtful utility. Of this, however, we shall soon have a better opportunity of judging, as recent intelligence from Europe apprises us that such a projectile is at this moment engaging the attention of the Prussian government. The journals of the 1st ult. received by the Caledonia, state that an officer in the Prussian service, M. de Bismark, was then at Spandau, experimenting with a ball that, when it struck an object, enveloped it in a fire which could not be extinguished; but no details are given.

"The English Parliament has lately paid a great deal of attention to the discovery of Mr. Warner, which, according to an official report, must for ever confer the mastery of the seas on that nation which is the first to adopt it. A powerful state has already offered the inventor a reward of 7,500,000 francs to disclose his secret, but it is believed that he is too much of a patriot to allow other nations to derive the benefit of his discovery. It was not, therefore, by him that we were informed of this discovery when we mentioned it more than a year ago, along with many others, which were then considered visionary, but of the reality of which every day affords proof.

"It is stated that the destructive effects of this missile may be extended to a distance equal to the range of a Congreve rocket, charged with Greek fire, and fired from a cannon in the manner we have described. But the most terrible engine of Mr. Warner is a boiler filled with the materials that compose the Greek fire and with water, which can be heated to 25 atmospheres when required. The steam exerting an enormous pressure on the oily and resinous substances in a state of incandescence, it is only necessary to open the stopcock of a pipe in order to produce a stream of fire many hundreds of metres in length, and to cover the sails and rigging of a ship with a thousand inextinguishable fires. The member of the House of Commons who states that a fleet of a hundred vessels would not be able to resist such a meteor for an hour, is perfectly right. If it were a question in what manner it would be possible to approach these hundred vessels armed with cannons? this can now be easily accomplished by means of steam, and and with the Archimedean screw substituted for the paddle-wheels, which are the vulnerable part of ordinary steamboats.

"Cuirasses have been made to resist bullets; they will now be made to resist cannon balls; for it is known that nothing can be easier than to construct a vessel impervious to the heaviest projectiles, by providing it with planks of sufficient thickness covered with sheets of lead, iron,

and of timber, as the Americans have already done. This vessel having neither cannon nor lading, nor a numerous crew on board, and not being intended for taking a voyage, would be able to appropriate its whole tonnage to making itself proof against cannon balls.

"Thus prepared, and taking a becalmed fleet by surprise, if the *Infernal* does not sail well, two hours instead of one would accomplish the destruction. If necessary, such a ship would be able to enter all the enemy's ports, destroy everything that came within its range, and escape uninjured. The secret is now divulged. Every one may make the attempt; the most alert will succeed.

"Let it not be said the thing is impossible—impracticable. We have applied to all intelligent engineers, mechanics, and chemists: there is not one who will not undertake to construct one of these infernal machines for a million of florins; but representative governments will not pay attention to it till it is too late."

Happily, the tardiness of 'representative governments' to notice these inventions is not fatal to the genius which produces them, or we should not possess the torpedo or the percussion bomb.

Within the past month several experiments have been made at Washington, before the heads of the departments and several officers of the army and navy, by Dr. Alexander Jones, a gentleman lately returned from Europe, with a very destructive shell of his inventing. It is described as a small tin case, some three or four inches diameter, which, upon being thrown by hand into a sheet of water, at a distance of 20 or 30 yards, exploded with the most startling effects, sometimes throwing the water to a height of more than 100 feet; at other, scattering it over the spectators in the form of a heavy spray. It was shown in different trials that the shell may be so adjusted as to burst either upon touching the surface, when it is just immersed, or not until it has reached the bottom. The inventor stated that it might be handled with perfect safety: in proof of it, he kicked several of them about until the cases were deeply indented, and then threw them into the water, when they exploded, as before. They are fired without a fuse. There were in all 13 shells discharged, and not a single failure occurred. It is to be regretted that there were not any of them directed against some solid body, that we might the better compare the power of this shell with that of Mr. Warner's projectile.

As another item of information, though of subordinate interest,

we should add that we have recently received information of several warlike inventions, probably not inferior in destructive power to either of the others, which the projectors, for obvious reasons, are averse to making public unless occasion require it.

We have been led to give the subject this extended notice not more from a sense of the obligation resting upon us to record all important inventions than from a desire to induce a just appreciation of the means of defense the government possesses, in the event of a war with a foreign power; to inspire with proper confidence those who think we are utterly unable to cope with the first nations of the earth, while we would discourage the belief infinitely more unsafe, for it is the grave of caution, that our navy is invulnerable.

For the American Repertory.

NEW KIND OF TRAVERSE TABLES.

BY J. A. POWERS, C. E.

When we consider that in all ages the most ingenious and learned persons have employed their time in writing on the subject of mathematics, and contemplate the present improved state of this science, we are not a little surprised that greater attention has not been paid to the system of constructing the most useful tables.

It is a fact well known to mathematicians, that all the essential properties of numbers are common to lines; also, that lines and numbers are governed by the same general laws. Galileo by an ingenious conception applied this principle to the construction of an instrument, the invention of which has been disputed by nations. Upon a similar principle are constructed the following tables of difference of latitude and departure, which are submitted to the readers of the Repertory as being not only more accurate, but also more extensive in point of distances, than any now extant; while the present occupy from twenty to thirty times less space than those in general use, which circumstances, the author trusts will render them acceptable to the surveyor and navigator, and at the same time not entirely uninteresting to the scientific.

TRAVERSE TABLE,

Showing the difference of Latitude and Departure for any whole or fractional distance not exceeding 1700, and for angles to even degrees between 1° and 90°.

DEG.	LAT. 100	DEP. 100	LAT. 200	DEP. 200	LAT. 300	DEP. 300	LAT. 400	DEP. 400	LAT. 500	DEP. 500	DEG.
1	9998	175	19997	349	29995	524	39994	698	49992	873	89
2	9994	349	19988	698	29982	1047	39976	1396	49969	1745	88
3	9986	523	19973	1047	29959	1570	39945	2093	49931	2617	87
4	9976	698	19951	1395	29927	2093	39903	2790	49878	3488	86
5	9962	872	19924	1743	29886	2615	39848	3486	49810	4358	85
6	9945	1045	19890	2091	29836	3136	39781	4181	49726	5226	84
7	9925	1219	19851	2437	29776	3656	39702	4875	49627	6093	83
8	9903	1392	19805	2783	29708	4175	39611	5567	49513	6959	82
9	9877	1564	19754	3129	29631	4693	39508	6257	49384	7822	81
10	9848	1736	19696	3473	29544	5209	39392	6946	49240	8682	80
11	9816	1908	19633	3816	29449	5724	39265	7632	49081	9540	79
12	9781	2079	19563	4158	29344	6237	39126	8316	48907	10396	78
13	9743	2250	19487	4499	29231	6748	38975	8998	48719	11248	77
14	9703	2419	19406	4838	29109	7258	38812	9677	48515	12096	76
15	9659	2588	19319	5176	28978	7765	38637	10353	48296	12941	75
16	9613	2756	19225	5513	28838	8269	38450	11025	48063	13782	74
17	9563	2924	19126	5847	28689	8771	38252	11695	47815	14619	73
18	9511	3090	19021	6180	28532	9271	38042	12361	47553	15451	72
19	9455	3256	18910	6511	28366	9767	37821	13023	47276	16278	71
20	9397	3420	18794	6840	28191	10261	37588	13681	46985	17101	70
21	9336	3584	18672	7167	28007	10751	37343	14335	46679	17918	69
22	9272	3746	18544	7492	27816	11238	37087	14984	46359	18730	68
23	9205	3907	18410	7815	27615	11722	36820	15629	46025	19537	67
24	9135	4067	18271	8135	27406	12202	36542	16269	45677	20337	66
25	9063	4226	18126	8453	27189	12679	36252	16905	45315	21131	65
26	8988	4384	17976	8767	26964	13151	35952	17535	44940	21919	64
27	8910	4540	17820	9180	26730	13619	35640	18160	44550	22699	63
28	8829	4695	17659	9389	26488	14084	35318	18779	44147	23474	62
29	8746	4848	17492	9696	26239	14544	34985	19392	43731	24241	61
30	8660	5000	17321	10000	25981	15000	34641	20000	43302	25000	60
31	8572	5150	17143	10301	25715	15451	34287	20602	42858	25752	59
32	8480	5299	16961	10598	25441	15898	33922	21197	42402	26496	58
33	8387	5446	16773	10893	25160	16339	33547	21786	41934	27232	57
34	8290	5592	16581	11184	24871	16776	33162	22368	41452	27960	56
35	8192	5736	16383	11472	24575	17207	32766	22943	40958	28679	55
36	8090	5878	16180	11756	24271	17634	32361	23511	40451	29389	54
37	7986	6018	15973	12036	23959	18054	31945	24073	39932	30091	53
38	7880	6157	15760	12313	23640	18470	31520	24626	39400	30783	52
39	7772	6293	15543	12586	23314	18879	31086	25173	38857	31466	51
40	7660	6428	15321	12856	22981	19284	30642	25712	38302	32139	50
41	7547	6561	15094	13121	22641	19682	30188	26242	37735	32803	49
42	7431	6691	14863	13383	22294	20074	29726	26765	37157	33457	48
43	7314	6820	14627	13640	21941	20460	29254	27280	36568	34100	47
44	7193	6947	14387	13893	21580	20840	28774	27786	35967	34733	46
45	7071	7071	14142	14142	21213	21213	28284	28284	35355	35355	45
DEG.	DEP. 100	LAT. 100	DEP. 200	LAT. 200	DEP. 300	LAT. 300	DEP. 400	LAT. 400	DEP. 500	LAT. 500	DEG.

DEG.	LAT. 600	DEP. 600	LAT. 700	DEP. 700	LAT. 800	DEP. 800	LAT. 900	DEP. 900	DEG.
1	59991	1047	69989	1222	79988	1396	89986	1571	89
2	59963	2094	69957	2443	79951	2791	89945	3141	88
3	59918	3140	69904	3664	79890	4187	89877	4710	87
4	59854	4185	69829	4883	79805	5581	89781	6278	86
5	59772	5229	69734	6101	79696	6972	89658	7844	85
6	59671	6272	69617	7317	79562	8362	89507	9408	84
7	59553	7312	69478	8531	79404	9750	89329	10968	83
8	59416	8350	69319	9742	79221	11134	89124	12526	82
9	59261	9386	69138	10950	79015	12515	88892	14079	81
10	59088	10419	68936	12155	78785	13892	88633	15628	80
11	58898	11449	68714	13357	78530	15265	88346	17173	79
12	58689	12475	68470	14554	78252	16633	88033	18712	78
13	58462	13497	68206	15747	77950	17996	87693	20246	77
14	58218	14515	67921	16935	77624	19354	87327	21773	76
15	57956	15529	67615	18117	77274	20706	86933	23294	75
16	57676	16538	67288	19295	76901	22051	86514	24807	74
17	57378	17542	66941	20466	76504	23389	86067	26313	73
18	57063	18541	66574	21631	76085	24721	85595	27812	72
19	56731	19534	66186	22789	75642	26045	85097	29301	71
20	56382	20521	65779	23941	75175	27362	84572	30782	70
21	56015	21502	65351	25086	74686	28669	84022	32253	69
22	55631	22476	64903	26222	74175	29969	83447	33715	68
23	55230	23444	64435	27351	73640	31258	82845	35166	67
24	54813	24404	63948	28472	73084	32539	82219	36606	66
25	54378	25357	63441	29583	72505	33809	81568	38036	65
26	53928	26302	62916	30686	71904	35070	80891	39453	64
27	53460	27239	62370	31779	71280	36319	80191	40859	63
28	52977	28168	61806	32863	70636	37558	79465	42252	62
29	52477	29089	61223	33937	69969	38785	78716	43633	61
30	51962	30000	60622	35000	69282	40000	77943	45000	60
31	51430	30902	60002	36053	68573	41200	77145	46353	59
32	50883	31795	59363	37094	67844	42394	76324	47693	58
33	50320	32678	58707	38125	67094	43571	75480	49018	57
34	49742	33552	58033	39144	66323	44735	74613	50327	56
35	49149	34415	57341	40150	65532	45886	73724	51622	55
36	48541	35267	56631	41145	64722	47023	72812	52901	54
37	47918	36109	55904	42127	63891	48145	71877	54163	53
38	47281	36939	55161	43096	63041	49253	70921	55409	52
39	46629	37759	54400	44052	62172	50346	69944	56639	51
40	45963	38567	53623	44995	61284	51423	68944	57851	50
41	45283	39364	52829	45924	60377	52485	68024	59045	49
42	44589	40148	52020	46839	59452	53530	66883	60222	48
43	43881	40920	51195	47740	58508	54560	65822	61380	47
44	43160	41679	50354	48626	57547	55573	64741	62519	46
45	42426	42426	49497	49497	56569	56569	63640	63640	45
DEG.	DEP. 600	LAT. 600	DEP. 700	LAT. 700	DEP. 800	LAT. 800	DEP. 900	LAT. 900	DEG.

TRAVERSE TABLE,

Showing the difference of Latitude and Departure for Points and Quarter Points, and for any whole or fractional distance not exceeding 1700.

Points.	LAT. 100	DEP. 100	LAT. 200	DEP. 200	LAT. 300	DEP. 300	LAT. 400	DEP. 400	LAT. 500	DEP. 500	LAT. 600	DEP. 600	LAT. 700	DEP. 700	LAT. 800	DEP. 800	LAT. 900	DEP. 900	Points.
0¼	999	49	1997	98	2996	147	3995	197	4994	246	5993	295	6992	344	7990	433	8990	442	7¾
0½	995	98	1990	196	2986	294	3981	392	4976	490	5971	588	6966	686	7961	784	8957	882	7½
0¾	989	147	1978	293	2968	440	3957	587	4946	733	5935	880	6924	1027	7914	1173	8903	1320	7¼
1	981	195	1962	390	2942	585	3923	780	4904	975	5885	1171	6866	1366	7846	1561	8827	1756	7
1¼	970	243	1940	486	2910	729	3880	972	4850	1215	5820	1458	6790	1701	7760	1944	8730	2187	6¾
1½	957	290	1913	581	2871	871	3828	1162	4785	1452	5741	1743	6698	2033	7655	2323	8612	2614	6½
1¾	942	337	1883	674	2825	1010	3766	1347	4708	1684	5649	2021	6591	2358	7533	2695	8474	3031	6¼
2	924	383	1848	765	2772	1148	3696	1531	4619	1913	5543	2296	6467	2679	7391	3061	8315	3444	6
2¼	904	428	1808	855	2712	1283	3616	1710	4520	2138	5424	2566	6328	2993	7232	3421	8136	3849	5¾
2½	882	472	1764	943	2646	1415	3527	1886	4409	2358	5291	2829	6173	3301	7055	3772	7937	4244	5½
2¾	858	514	1716	1028	2573	1542	3431	2056	4289	2570	5147	3084	6004	3598	6862	4112	7720	4626	5¼
3	831	556	1663	1111	2494	1667	3326	2222	4157	2778	4989	3333	5820	3389	6652	4444	7483	5000	5
3¼	803	596	1606	1191	2409	1787	3213	2383	4016	2979	4819	3575	5622	4170	6425	4766	7228	5362	4¾
3½	773	635	1546	1269	2319	1904	3092	2538	3865	3173	4638	3807	5410	4442	6183	5076	6956	5711	4½
3¾	741	672	1482	1343	2223	2015	2964	2686	3705	3358	4446	4029	5187	4701	5928	5372	6669	6044	4¼
4	707	707	1414	1414	2121	2121	2828	2828	3536	3536	4243	4243	4950	4950	5657	5657	6364	6364	4
Points.	100 DEP.	100 LAT.	200 DEP.	200 LAT.	300 DEP.	300 LAT.	400 DEP.	400 LAT.	500 DEP.	500 LAT.	600 DEP.	600 LAT.	700 DEP.	700 LAT.	800 DEP.	800 LAT.	900 DEP.	900 LAT.	Points.

Description of the Tables.

The first table shows the difference of latitude and departure corresponding to any distance not exceeding 1700, and for angles to even degrees between 1° and 90°. Table second is of the same nature, but for points and quarter points.

The numbers in the right and left hand perpendicular columns express angles; the numbers in the top and bottom horizontal lines, commencing at 100 and increasing to 900, represent distances in rods, miles, leagues, or any other proposed denomination, the peculiar arrangement of which is such that the first mentioned number may be supposed to represent 1. 10. 100. &c. according as we use the unit abstractedly or in connection with one or more cyphers. The unit, independent of the cyphers, may also be conceived to express $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$, &c. decimally, as occasion may require. These principles are general, and equally applicable to each of the other numbers in the distance lines of both tables.

If the given course is less than 4 points or 45°, it is to be taken from one of the left-hand columns, and the titles of the latitude and departure columns from the top; but if the course exceed 45°, it is to be taken from the right, and the title of the columns from the bottom.

In using these tables, it must be particularly observed that directly over or under the given distance, and corresponding with the course in its column, stand the latitude and departure in their columns, and to the right the decimal parts.

Example 1.—Suppose a ship sail N. 23° E. 80 miles: to determine the difference of latitude and departure?

Solution.—Corresponding with 23 in the left-hand column of table first, and under 80, stands 73.640 miles for difference of latitude, and 31.258 miles for difference of departure.

Example 2.—Suppose a ship sail S. 67° W. 20 leagues: to determine the difference of latitude and departure?

Solution.—Corresponding with 67° in the right-hand column of table first, and under 20, stands 7.815 leagues for difference of latitude, and 18.410 leagues for difference of departure.

Example 3.—Suppose a ship sail N. $2\frac{3}{4}$ points, W. 40 leagues: to determine the difference of latitude and departure?

Solution.—Corresponding with $2\frac{3}{4}$ points in the left-hand column of table second, and under 40, stands 34.31 leagues for difference of latitude, and 20.56 leagues for difference of departure.

Example 4.—A ship sails S. $7\frac{1}{4}$ points, W. 70 leagues: required the difference of latitude and departure?

Solution.—Corresponding with $7\frac{1}{4}$ points in the right-hand column of table second, and under 70, stands 10.27 leagues for difference of latitude, and 69.24 leagues for difference of departure.

Note.—If the given distance cannot be exactly found in the tables, it is to be decimally separated or decomposed, and the latitude and departure corresponding to each part determined separately; the aggregate of the results will express the difference of latitude and departure corresponding to the entire distance. For example:—Suppose a ship sail N. 42° W. $272\frac{1}{2}$ miles, and it was required to determine the difference of latitude and departure?

Solution.—This number, when separated, will be 200+70+2 +.5; and

Under	200,	corr. with	42° stands	148.63m.	for diff.	of lat. and	133.83m.	for diff.	of dep.
"	70	"	"	052.02	"	"	046.839	"	"
"	2	"	"	001.4863	"	"	001.3383	"	"
"	0.5	"	"	000.37157	"	"	000.33457	"	"

Consequently the diff. of lat. is 202.50787m. and diff. of dep. 182.34187m.

WHO FIRST INTRODUCED THE USE OF EXPANSIVE STEAM FOR MARINE ENGINES?

If the reader believe, as we do, that the history of the marine engine would not present the series of astonishing successes it does but for the introduction of expansive steam, he will deem the question we have placed at the head of this article one of exceeding interest; and if there are rival claimants, one that cannot be discussed too early.

In an article contributed by Prof. Renwick for Tredgold's late work on the Steam-Engine, he says: "It appears probable that the use of a valve, cutting off the steam at half stroke, had at first no other object in view than a saving of fuel. The

person who first ascertained as a practical result that a greater speed might be attained in a given vessel by using steam expansively, was Adam Hall—at that time the Director of the workshops of the West Point Foundery Association. He, at all events, entered very fully into the practical investigation of this subject, and drew up a paper exhibiting his views, which which was communicated to the writer of this essay. The same views had been previously exhibited theoretically, by the writer, in a public course of lectures delivered in February and March, 1830. These were soon after made public in a treatise on the Steam-Engine, which, it is believed, had some influence in the improvements that have since been made in navigation by steam."

Prof. Renwick, we think, is in error both as to the gentleman named in his article and the date at which he fixes the discovery. We have been put in possession of a number of facts which go to prove conclusively that the person who first used steam expansively, and at a much earlier period, was F. B. Ogden, Esq. of New-Jersey, now or late U. S. consul at the port of Liverpool.

As early as 1808, when Mr. Fulton was making his first trials on the Hudson River, the attention of Mr. Ogden was attracted to the steam-engine as connected with navigation. In 1811 he assisted in a series of experiments made at the instance of his uncle, late the Governor of New-Jersey, with the view to its introduction on a ferry owned by the latter, between Elizabethtown Point and New-York. This led him to a close investigation of the subject, when he was forcibly struck with the extraordinary advantages to be derived from using the expansive power of steam, which to his astonishment had never yet been made available. He made a drawing that year of a double engine, united at right angles, to consume the same quantity of steam required for a single one; that is, cutting it off at $\frac{1}{2}$, and using it expansively for the rest of the stroke.

At the breaking out of the war, his attention was attracted to other objects, and the subject of steam was not again entertained until 1813, when appointed to the superintendence of the building of two boats at Pittsburgh, for a company in New Orleans, he had leisure to give it his full consideration. This resulted

in an application for a patent, which was granted, bearing date 31st Dec. 1813. His claim was therein set forth as "combining two or more cylinders in such a manner as to form one engine, with the view to cutting off the steam, of whatever pressure, at $\frac{1}{4}$, $\frac{1}{3}$, or $\frac{1}{2}$ the stroke of the piston, and using it expansively for the residue." Incidental to this he claimed, "the arrangement of the cranks at right angles in two cylinders, or at 120 degrees in three, thereby enabling them to carry each other over the dead points."

In 1814, an engine was constructed under the sanction of Mr. Ogden, by B. H. Latrobe, Esq. for a woolen manufactory at Steubenville, Ohio, which gave great satisfaction to the proprietors; and in the following year he had his first marine engine placed on board a boat of 230 tons, to run on James River, between Norfolk and Richmond. The engine of this boat was built in Elizabethtown, N. J. It consisted of two cylinders, 27 inches diameter, with a 4 ft. stroke shutting off the steam at $\frac{1}{2}$.

In 1816, Mr. O. went to England, for the purpose of having an engine built there. He submitted his plans to some of the most eminent engineers of the day, and among others, to the celebrated James Watt. To use the words of our informant, "he often speaks with great interest of his interview with that celebrated man. He had met with incredulity and doubt in some to whom he had explained his views; but no sooner had Mr. Watt examined his plans and heard his explanations than he exclaimed, 'I do not hesitate to say, Mr. Ogden, that this will make you a beautiful engine, and that you will derive the advantages you anticipate from it.' In reply to Mr. Ogden's question, if he was right in believing himself the inventor? he said: 'The expansive power of steam has been long used in Cornwall, where much larger engines are erected than are at first required: of course, they are not put to their full work; $\frac{1}{4}$ or $\frac{1}{3}$ of the power being sufficient, the cylinders are only thus far filled with steam, and the residue of the stroke is made by expansion.' 'Two or more cylinders have also been so placed as to be combined when required; but I am not aware that they have ever been so united with a view to the advantages you propose.' "

An estimate for the work was made out by Messrs. Watt & Bolton; but it so far exceeded Mr. O.'s expectations, that he was induced to apply to Messrs. Murray & Co. of Leeds, whose offers were so much more moderate that he immediately contracted with them for a double acting engine, consisting of two cylinders, 30 inches diameter, 4 ft. stroke, with double condenser, air pumps, &c. &c. so united that the power of each should be communicated to the same shaft by cranks at right angles with each other, a throttle valve to be attached to each cylinder with a cut-off at $\frac{1}{2}$ stroke. The whole weight of the engines and boilers when completed was 68 tons. Mr. Murray was an ingenious, practical man; he took great pride in the job; nothing to be compared with it in magnitude for marine purposes having yet been undertaken in England. But he never could be made to understand the principle of expansion, insisting to the last that *wire-drawing* the steam would produce the same effect. It was only through Mr. Ogden's positive orders that the throttle valves and cut-offs were introduced.

In the mean time his patent was infringed in a variety of instances on the Mississippi and Ohio rivers, both in high and in low-pressure engines, for one of which piracies he brought a suit in the District Court of the United States at New Orleans, and obtained a verdict for $1000. An appeal was taken to Washington, where the verdict was confirmed.

In 1824, Mr. Ogden purchased in New Orleans an engine which had been built by Murray & Co. from the same patterns that had been used in the one built for him in 1817. He had it brought to New-York, and employed the West Point Foundery Association to set it up on board a vessel he had built for a tug-boat on the Mississippi. The work was done under his immediate and constant supervision; and among the men employed was Mr. Hall, of whom Prof. Renwick speaks as the person entitled to the credit of first ascertaining the practical result of using expansive steam.

We have here given, in the most concise form, the evidence upon which Mr. Ogden's claim is based: comment might have hidden the strong impress of truth it bears. We cannot but express our surprise, however, that his native country should

have withheld a right that has been freely yielded to him in England. In the London Mechanics' Magazine for the year 1829, his pretensions are clearly and boldly set forth, challenging contradiction: they have remained uncontradicted to this day. A few years since, when the project of establishing a regular communication by steam between England and the East Indies was a prominent topic, evidence was given before a committee of the House of Commons by a number of engineers and scientific gentlemen, upon the various matters affecting the proposed measure. So strongly associated with the use of steam expansively was Mr. Ogden's name at that time, that he was called upon to give the results of his experience with it in marine engines, and also to furnish such other information respecting the navigation by steam of our rivers and lakes as the committee desired to obtain. Those who may feel enough interest in this subject to search for authorities, if they have not access to the Report of the committee, will find in the Edinburgh Review, Vol. LX, a very able review of it, in which a principal part of Mr. Ogden's testimony is quoted at length.

[For the American Repertory.]

TERRESTRIAL MAGNETISM.

BY H. H. SHERWOOD, M. D.

My attention has been directed to an article in the July number of Silliman's Journal for 1841, entitled "Corresponding Magnetic Observations," by Prof. Bache of Philadelphia, and Prof. Lloyd of Dublin, in which the editors say, "it is with much pleasure that we republish, from the Proceedings of the Royal Irish Academy (for June 22, 1840) the following account, by Prof. Lloyd of Dublin, of a series of simultaneous magnetic observations, made in Nov. 1839, by Prof. Bache at Philadelphia, and Prof. Lloyd at Dublin, with a view to determine whether any deductions could be drawn from them for determining differences of longitude. The results are very satisfactory, inasmuch as they prove definitely that no correspondence whatever exists between the smaller changes of declination at

Dublin and at Philadelphia, and that the determination of differences of longitude by means of the magnet, at such distances, is impracticable."

As this conclusion adopted by the Journal, in the language of Messrs. Lloyd and Bache, is to my mind a very extraordinary one, not warranted by the premises or facts elicited by the observations, and being besides in direct contradiction to the theory which I have maintained and promulgated, I am compelled to ask you to allow me to demonstrate, in the Repertory, the fact that differences in longitude, by means of a magnet, can be determined at such distances, or any other, with facility and great accuracy. In proceeding, with your permission, I propose to be as concise as possible; and for this purpose, shall first assume the fact that the earth is magnetized geometrically, has two magnetic poles which revolve from east to west in a spiral manner, at the annual rate of 32′ 26″, by the repulsive force of our magnetized sun, mark the arctic and antarctic circles, and determine the inclination of the earth's axis to the plane of the ecliptic. I shall next assume the fact that the longitude of the pole in the arctic circle, the 15th of Sept. 1837, as determined by me, from an observation on the variation at Buffalo, N. Y. by R. W. Haskins, and reduced by Dr. Scott of that city, was 92° 37′ 9″ 55‴ W. from Greenwich, and that the longitude of the pole in the antarctic circle was at the same time 157° 46′ 50″ 05‴ E.

I shall determine the longitude of places from Greenwich; and will first calculate the longitude of the Observatory by its latitude, and the declination of the magnetic needle there.

Observatory, Greenwich.—Lat. 51° 29′ 22″=13° 25′ 20″ 25‴.*
Declination 23° 01′ 19″ 48″ W. by calculation, Sept. 15, 1837.†

13° 25′ 20″ 25‴	Lat. 66° 32′−6° 28′ ‡=15° 39′ 42″ 34‴
+13 25 20 25	−13 25 20 25
26 50 40 40	2 14 22 09

* The 13° 25′ 20″ 25‴ are tabular numbers, determined by plane trigonometry. Thus, 90° 00′ : 23° 28′ : : 51° 29′ 22″.

† It is easy to determine the declination at any place, its latitude and longitude being known.

‡ The angle of the line of no variation with the earth's axis.

−2 14 22 09
24 36 18 31 maximum declination at Observatory.
−23 01 19 48 declination.
1 34 58 43 decrease of dec. since the time of the maximum.
24° 36′ 18″ 31‴=45° 31′ 05″ 36‴*
+45 31 05 36
91 02 11 12
+1 34 58 43
92 37 09 55
92° 37′ 09″ 55‴ W. long. magnetic pole, Sept. 15, 1837.
−92 37 09 55
00 00 00 00 long. of Observatory.

LONDON.—Lat. 51° 31′=13° 25′ 31″ 25‴=3° 42′ 05″ 38‴. Declination 11° 15′ E. by Burrough, 1580.
138° 55′ 22″ 00‴=32′ 26″×257 years.
−92 37 09 55 W. long. magnetic pole, Sept. 15, 1837.
46 18 12 05 E. " " " " 1580.
−23 28 00 00 obliquity of the ecliptic.
22 50 12 05
−3 42 05 38=6° 28′ the angle of line of no variation.
19 08 06 27
−18 57 43 06=11° 15′ declination.
00 10 23 21
−00 7 00 00 difference in time of year.
00 3 23 21 W. long. of place of observation.

The 3° 42′ 05″ 38‴ are tabular numbers determined by plane trigonometry. Thus, 90° 00′ : 6° 28′ : : 51° 31′.

The 32′ 26″ used above is the annual rate of motion of the magnetic poles from east to west.

The declination is converted into degrees of longitude.

The annual rate of motion of the poles being 32′ 26″, and the date of the longitude of the poles being Sept. 15, the difference in the time of year may in some cases amount to about 23′.

LONDON.—Lat. 51° 31′. Declination 5° 36′ E. by Humber, 1612.
121° 37′ 30″ 00‴=32′ 26″×225 years. 1837
−92 37 09 55 W. long. mag. pole Sept. 15, 1837. 1612
29 00 20 05 E. long. pole Sept. 15, 1612. 225
−23 28 00 00 obliquity of ecliptic.
5 32 20 05
−00 7 00 00 difference in time of year.
5 39 20 05
− 5 36 00 00 declination.
00 3 20 05 W. long. of place of observation.

* Tabular numbers, in which the declination is converted into degrees of longitude.

LONDON.—Lat. 51° 31′=13° 25′ 31″ 25‴. Declination 4° 04′ E. by Gellibrand, 1633.

110° 16′ 24″ 00‴=32′ 26″×204 years.
−92 37 09 55 W. long. magnetic pole, Sept. 15, 1837.
17 39 14 05 E. long. magnetic pole, Sept. 15, 1633.
−13 25 31 25=23° 28′ obliquity of ecliptic.
4 13 42 40
−00 7 00 00 difference in time of year.
4 06 42 40
− 4 04 00 00 declination.
00 2 42 40 W. long. of place of observation.

PARIS.—Lat. 48° 50′ 15″=12° 43′ 50″ 11‴. Declination 22° 04′ by M. Arago,* July 1, 1835. Obliquity of ecliptic 23° 27′ 38″.

12° 43′ 50″ 11‴ 66° 32′—6° 28′=15° 39′ 42″ 34‴
+12 43 50 11 —12 43 50 11
25 27 40 22 2 55 52 23
— 2 55 52 23
22 31 47 59 maximum declination=41° 40′ 45″ 24‴.

92° 37′ 09″ 55‴ W. long. of magnetic pole Sept. 15, 1837.
—00 58 06 35 difference in time—rate 32′ 26″.
91 39 03 20 W. long. of magnetic pole July 1, 1835.
—46 56 00 00 double the obliquity of the ecliptic.
44 43 03 20
—00 41 41 14=13° 25′ 31″ 25—12° 43′ 50″ 11‴†
44 01 22 06
—41 40 45 24
2 20 36 42‡ E. long. of Paris (Observatory.)

FREDERICKSBURGH, (Denmark.)—Lat. 58° 06′=15° 08′ 56″ 32‴. Dec. 18° 50′ W. by Prof. Hansteen, 1810.

15° 08′ 56″ 32‴ Lat. 66° 32′−6° 28′=15° 39′ 42″ 34‴
+15 08 56 32 15 08 56 32
30 17 53 04 00 30 46 02
−00 30 46 02
29 47 07 02 maximum dec.
—18 50 00 00 declination in 1810=34° 50′ 26″ 30‴
10 57 07 02

34 50 26 30
10 57 07 02
+15 08 56 32—23° 28′
95 46 56 34

* The declination given by M. Arago is greater than it really was at the time by about 4′.

† The difference between the angles of the magnetic meridians of the observations of London and Paris.

‡ The longitude of Paris is 2° 20′ 24″ according to Norton.

92° 37′ 09″ 55‴ long. pole 1837.
— 3 37 36 18=8′ 03″ 34‴×27 years.

—88 59 33 37
95 46 56 34

6 47 22 57
—00 9 37 03 difference in time of year equal to 4′ 45″.

6 57 00 00 longitude of place of observation.

The yearly rate of decrease of variation in lat. 58° 06′ is about 11′.

The 8′ 03″ 34‴ used above is the mean ratio of increase of the declination on the earth where it is increasing, and of its decrease where t is decreasing. This rate gradually increases from the equator to the magnetic poles, where it amounts to 32′ 26″.

Christiania, (Norway).—Lat. 59° 45′=15° 34′ 45″ 20‴. Declination 20° 03′ W. by Prof. Hansteen, 1817.

15° 34′ 45″ 20‴ — Lat. 66° 32′—6° 28′=15° 39′ 42″ 34‴
+15 34 45 20 — —15 34 45 20

31 09 30 40 — 00 4 57 14
—00 4 57 14

31 04 33 26 maximum dec.
—20 03 00 00 dec. 1817.

11 01 33 26

20° 03′=37° 05′ 29″ 17‴
37 05 29 17
11 01 33 26
+15 34 45 20—23° 28′

100 47 17 20

92 37 09 55 W. lo. mag. po. Sep. 15, 1837.
— 2 41 09 20=8′ 03″ 34‴×20 years

—89 56 00 35
100 47 17 20

10 51 16 45
—00 9 16 45 difference in time of year, equal to 4′ 20″.

10 42 00 00 long. of Christiania.

Tobolsk, (Siberia.)—Lat. 58° 12′=15° 10′ 30″ 24‴. Declination 7° 09′ W. by Shubert, 1805.

15° 10′ 30″ 24‴ — Lat. 66° 32′—6° 28′=15° 39′ 42″ 34‴
+15 10 30 24 — —15 10 30 24

30 21 00 48 — 00 29 12 10
—00 29 12 10

29 51 48 38 maximum declination in lat. 58° 12′.
— 7 09 00 00 declination.

22 42 48 38=42° 01′ 06″ 32‴
+42 01 06 32

84 02 13 04
—8 17 29 36

75 44 43 28
—7 09 00 00 declination.

23° 28′ 00″ 00‴
—15 10 30 24

8 17 29 36

68 35 43 28
—00 10 43 28 diff. in time of year equal to 5′ 22″.
68 25 00 00 long. Tobolsk.

Rome.—Lat. 41° 54′=10° 55′ 30″ 08‴=3° 00′ 38″ 08‴. Declination 17° 12′ W. by Cassini, 1788.

92° 37′ 09″ 55‴ W. long. magnetic pole, Sept. 15, 1837.
—26 29 14 00=32′ 26″×49 years.
66 07 55 55 W. long. magnetic pole, Sept. 15, 1788.
—23 28 00 00 obliquity of ecliptic.
42 39 55 55
—10 55 30 08—23° 28′
31 44 25 47
— 3 00 38 08—6° 28′
28 43 47 39
—17 12 00 00 dec.
11 31 47 39
—00 41 20 27 difference between the angles of the magnetic meridians of Rome and Greenwich.
12 13 08 06
—00 14 51 54 difference in time of year.
12 28 00 00 E. long. of Rome.

Leyden.—Lat. 52° 08′=13° 36′ 17″ 24‴=3° 44′ 45″ 05‴. Dec. 5° E. by Peter Adsiger, 1269.

13° 36′ 17″ 24‴
+13 36 17 24
27 12 34 48

307° 00′ 28″ 00‴=32′ 26″×568 years.
— 92 37 09 55 long. magnetic pole, Sept. 15, 1837.
214 23 18 05 E. long. of magnetic pole, 1269.
+145 36 41 55 W. " " "
360 00 00 00

145° 36′ 41″ 55‴ W. long. of magnetic pole in 1269.
27 12 34 48 double the angle of magnetic axis in latitude.
6 29 05 08 angle of line of no variation in 1269.
0 09 13 59 difference between the angles of the magnetic meridians of London and Leyden.
+ 5 00 00 00 declination.
184 27 35 50
+ 00 00 24 10 difference in time of year.
184 28 00 00
—180 00 00 00 W. long. from London.
4 28 00 00 E. long. of Leyden.

Peter Adsiger says: "The exact quantity of this declination I have found, after numerous experiments, to be 5°;" and the result of this calculation shows it to have been obtained by an observation on the sun, at the time of the equinox in September, 1269.

These examplés of the determination of differences of longitude by means of the magnet, are copied from my unfinished work on the magnetism of the earth. I might have copied from it a much greater number of examples, and accompanied them by the rules for determining the longitude of places over every part of the earth; but these are deemed sufficient for my purpose, for they disprove in the most positive manner the conclusion drawn by Messrs. Lloyd and Bache, in regard to the impracticability of determining differences of longitude by the magnet, at great distances.

The line of maximum declination, which corresponds with the magnetic axis, and is always perpendicular to the plane of the ecliptic, passed over London in 1823, and is now 9° 43′ W. of the Observatory. This line passes through the south-west part of Ireland, and from thence in a south-westerly direction near Brest, Bayonne, and through the north-east part of Spain. On the east side of this line the declination is decreasing as far as China, while it is increasing on the west side of it as far as Wilmington, N. C. The magnetic needle is attracted to the east where the declination is decreasing; and to the west, or in a contrary direction, where it is increasing; and with a knowledge of this fact it does not require simultaneous observations to know that no correspondence exists between the oscillations or smaller changes of the declination on the different sides of this line.

For the American Repertory.

REMARKS ON WATER-SPOUTS.

Upon a cursory examination, the seemingly apparent analogy between the phenomena of water-spouts and whirlwinds is so grreat, that it is not surprising to find it the general conception of all uninformed minds, that they proceed from similar causes; and I regret, further, to observe, that this opinion has been adopted by several distinguished philosophers, and advocated by many of the most eminent writers on natural science.

A mathematical investigation, however, of the premises upon

which this hypothesis is based, so far from establishing it, will on the contrary show the physical impossibility of the production of water-spouts through the mechanical action of whirlwinds.

The wind which, when it moves with a velocity of one hundred miles per hour, produces the most tremendous effects, exerts a force of barely $\frac{3417}{10000}$ of a pound avoirdupois on a square inch. Accordingly, if a whirlwind were produced by opposite currents moving at the rate of 100 miles per hour, the greatest effect that could possibly be exerted in raising a column of water would be less than $\frac{6834}{10000}$ of a pound to an inch,—a force quite inadequate to lift a column of even 16 inches diameter, since under these circumstances the weight of a horizontal stratum would exceed the force exerted in sustaining it.* Furthermore, the pressure of the atmosphere upon a perfect vacuum is only equal to the weight of a column of water about 34 feet in height: accordingly, if water-spouts were produced through the mechanical action of whirlwinds, they could never exceed a similar altitude. So far from this, however, they are not unfrequently several hundred feet; and in one instance, Capt. Napier, of the British navy, measured geometrically the height of one which exceeded 1700 feet.

Owing to the fact that water-spouts are almost invariably attended with electrical phenomena, several able writers of the present day have referred their production to electrical agency; and although they have not generally attempted to show its particular modus operandi in their formation, nevertheless this opinion is not to be entirely disregarded.

Among many experiments which would lead us to a similar conclusion, perhaps there is none more simple, and at the same time that affords a more striking analogy, than the following:

If a small reservoir or basin nearly filled with water be placed on the prime conductor of an electrical machine, and if, whilst the cylinder is being turned, a few drops of water (placed on the discharger) be brought within striking distance of the surface

* This argument applies to the hypothesis adopted by those who reject the more generally received and advocate the still more absurd supposition, that water-spouts are produced through the agency of whirlwinds independent of the formation of a vacuum.

of the water in the basin, a perfect water-spout will be produced, which (if we conceive the water in the basin to represent the ocean, and the drops on the discharger a cloud) will develop in miniature all the leading properties of those formed on the grand scale of nature.* Several zigzag sparks will pass between the discharger and water; the drops will assume the form of an inverted cone, the lower extremity or apex of which will approach the water in the basin, whose surface becomes considerably agitated.†

It need not be remarked that water-spouts are much less frequent on continents than on the ocean,—a fact which, upon the hypothesis of their production through the mechanical action of whirlwinds, is quite inexplicable. Upon the greater part of the surface of the ocean the winds are reducible to fixed and determinate laws: on the other hand, upon continents, although we may assign the general causes of winds, yet the order and periods of their recurrence are exceedingly irregular; accordingly, whirlwinds are much more frequent; and if we suppose them to be the cause of water-spouts, the necessary and unavoidable inference is that they also are more frequent on continents than on the ocean.

Moreover, it is well known that water-spouts are invariably accompanied with clouds, which enter into and perform an active part in their formation,—a phenomenon which, if they have their origin through the agency of whirlwinds, is also without an explanation. If, however, we assume as a postulatum, that water-spouts are produced through electrical agency, the fact of their more frequent occurrence on the ocean, together with the circumstances of clouds and of electrical developments, so far from remaining unexplained phenomena, become necessary consequences. J. P.

New-York, September, 1841.

---

* The experiment may be varied by connecting one end of the discharger with the prime conductor, and bringing the basin within striking distance of the drops.

† A more perfect and striking analogy could not well be imagined. It is particularly worthy of remark that the water in the basin, under the drops, becomes perceptibly convex; but whether this takes place simultaneously with, or anterior to, the formation of the cone, it is quite difficult to determine.

For the American Repertory.

THE ERICSSON PROPELLER AND THE ARCHIMEDEAN SCREW.

TO PROF. J. J. MAPES :

Dear Sir :—

It is with great reluctance that I notice the anonymous critic on my patent Propeller, which appeared in the last number of the American Repertory, emanating as it does from the same person who has figured in the pages of this journal for some time, and become so notorious by his bad and confused reasoning, fallacious experiments, thorough disregard for truth, coarse style, and great ignorance not only of the subjects he undertakes to discuss, but also of the first principles of physical science generally ; circumstances which would quite discourage me from entering on a controversy or making any reply, were my own interest alone at stake ; but more important considerations demand that the calumny of this anonymous writer should be exposed.

Before I proceed to notice the contents of the criticism alluded to, I will first give a description, accompanied by an accurate delineation of my patent Propeller and the Archimedean screw respectively, in order to point out the exact difference of construction of the two.

Fig. 1 represents a side elevation of the Archimedean screw applied as a propeller ; and

Fig. 2, an end view thereof in the line of its axis.

Fig. 3 represents a side elevation of my patent Propeller ; and

Fig. 4, a front view in the perpendicular plane to its axis.

In order to render a comparison easy, these representations of the Archimedean screw and the Propeller have been drawn to the same scale, and so arranged that an equal number of revolutions of each will give not only an equal amount of propulsive power, but also equal progressive movement through the water ; the angle of the spiral plates of the Propeller and the spiral blade of the Screw being moreover that which is requisite for propelling vessels, by applying the steam power *directly* to their axes, without the intervention of cog-wheels or

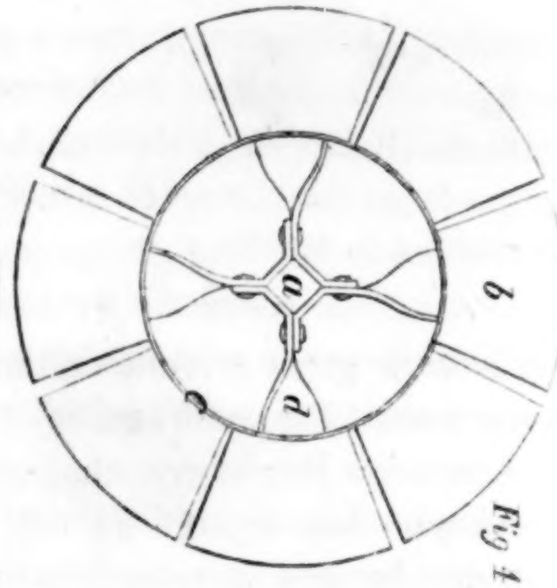

Fig 4

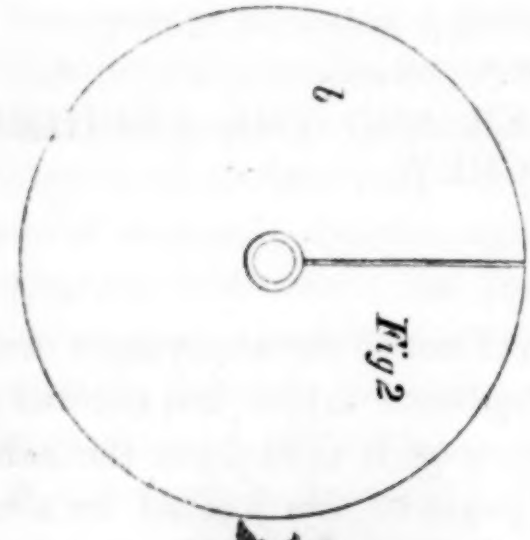

Fig 2

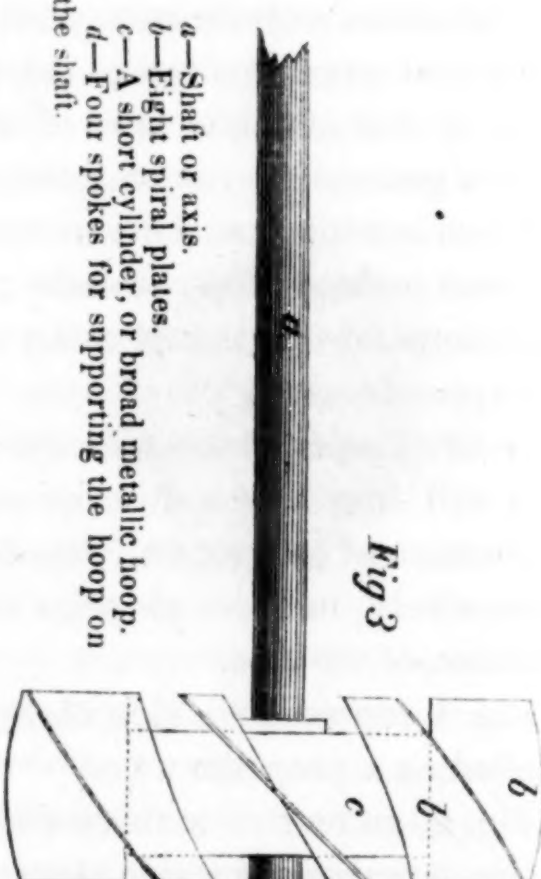

Fig 3

a—Shaft or axis.
b—Eight spiral plates.
c—A short cylinder, or broad metallic hoop.
d—Four spokes for supporting the hoop on the shaft.

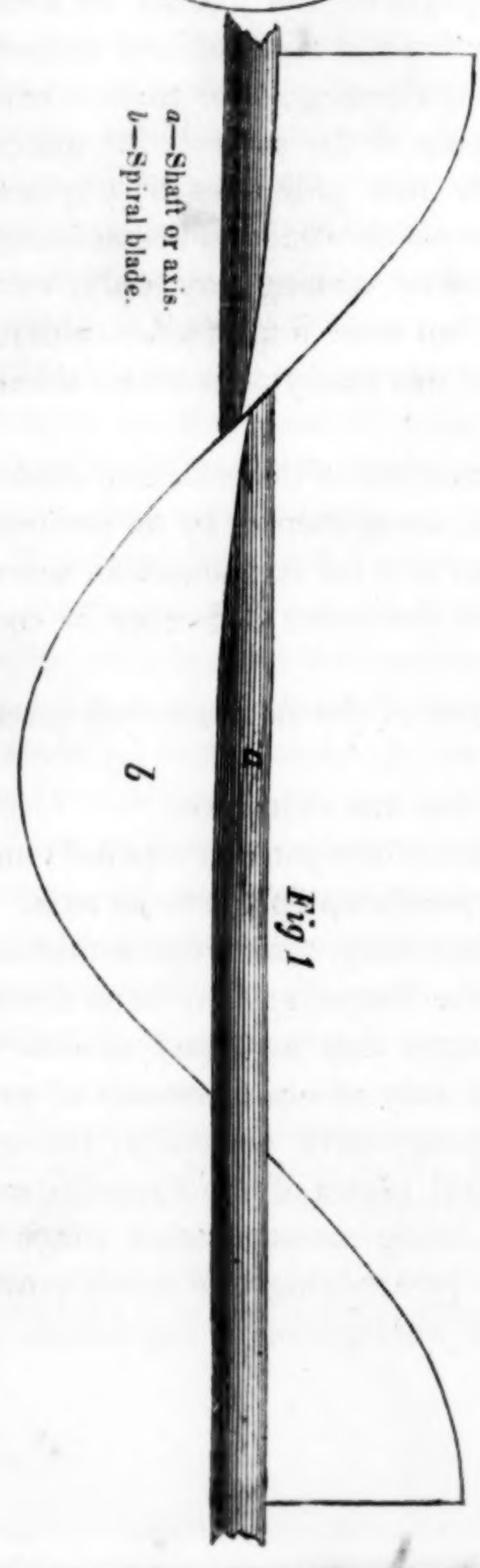

Fig 1

a—Shaft or axis.
b—Spiral blade.

other multiplying gear. A mere inspection of the annexed drawing will therefore point out the leading features of distinction between the Propeller and the Screw, and make it at once apparent that the latter, if moved at the same moderate speed which is sufficient in the former, viz. the speed attainable by a *direct* connection to the engine, will be of such an inconvenient length as to make it practically useless. A screw of 12 feet diameter will occupy upwards of 37 feet in length, and require to be turned round at a more rapid rate than any steam-engine of large power has yet been made to work, as even 35 revolutions per minute will hardly be sufficient to propel a vessel at the rate of 10 knots per hour. To remedy this radical defect, the parties who have been for sometime engaged in the application of the Archimedean screw in England have devised the plan of giving a reduced angle to the spiral blade; but in so doing they have encountered another equally great difficulty, the vast increase of speed which must be given to the Screw, and which can only be obtained by the introduction of cog wheels or other equally objectionable contrivances for multiplying the *limited* speed of the engine.

The practical inconvenience attending the use of cog-wheels for increasing the speed, became manifest during the early trials of the experimental steamboat "Archimedes," and consequently the Great Western Steamship Company, who intend to employ the Archimedean screw in their large iron ship now building at Bristol for the trans-Atlantic commerce, have determined, it is confidently stated, to obviate the objectionable use of cog-wheels by substituting a *rope band* working over two drums of unequal diameters, to give the requisite high speed to the Screw. I need not dwell on the merits of an invention which calls for *such* expedients.

The great difference, then, between the Archimedean screw and my patent Propeller consists in this: that whilst I am enabled to give any desirable speed to the vessel by a *direct* application of the engine to the axis of the Propeller, which in fact becomes the crank shaft; the parties who patronize the Screw must resort to the highly objectionable and almost impracticable contrivances before described.

The inconvenient length of the Screw, even when worked at a high velocity, has led to a number of suggestions for its improvement, the most obvious one being that of employing *several* threads or blades placed opposite each other. Mr. Smith, the patentee of the application of the Archimedean screw in England, whilst engaged in the construction of the "Archimedes," was present at the trials on the Thames of the iron steamboat "Robert F. Stockton," (the second boat to which the Propeller had been applied) and having an opportunity afforded him of inspecting the machinery when the boat was out of water on the beach, was forcibly struck with the great advantage of the Propeller in point of length; in consequence of which, he at once sought for an *amendment* to his patent, which was granted so far as the employing a double screw, or two opposite blades. But this *first step* in imitating the Propeller, by *dividing* the propelling surface, has been found insufficient in reducing the length of the Screw to practicable limits; hence the Great Western Steamship Company intend to employ *several* opposite blades; in doing which, however, the character of Mr. Smith's *invention* (?) is entirely changed: it is no longer an Archimedean screw, but a wheel, from the centre of which a number of spiral plates or wings radiate. That this modification "evasion" of the Screw closely approaches the principle of my Propeller no one will deny; still the evasion, though far more practicable than the much lauded screw, will yet be found inferior in many respects as compared to the Propeller. Leaving the greater length and want of stability out of question, the very unfavorable action of the spiral blades or wings towards the centre remains a most serious objection.

Thus another great difference manifestly exists between the Archimedean screw and my Propeller—if indeed there be any similarity at all; the former consisting of a spiral blade diverging from the centre, whilst the latter consists of a short cylinder, through which the water passes freely during the progress of the vessel, the arms which support said cylinder on the axis being made of a spiral or winding form, so as to thread their way edgeways through the water; and the propelling surfaces, by acting at considerable distance from the centre of motion,

completely obviating the very unfavorable action of the spiral blades of the Archimedean screw and its modifications. In addition to which should be mentioned the great practical advantage derived from the application of the short cylinder, that, *by attaching to it a greater number of spiral plates of reduced dimensions, the length of the Propeller may be diminished at pleasure*, whilst the total amount of propelling surface remains undisturbed. Were a division of the spiral blade of the Archimedean screw carried to the same extent, as indeed has been in some degree attempted by the "evasions" before alluded to, the centre would be crowded with a number of inactive surfaces nearly parallel to the line of the axis, tending only to give a rotary motion to the water, by which power would be absorbed, and reäction offered to the progress of the vessel. Contrast this defect in the Archimedean screw and its modifications, to the absence of similar obstruction at the centre and within the series of spiral plates of the Propeller.

In the face of all these facts, no man actuated by honest motives could have penned the following sentence, viz:—"Now when this contrivance of 'J. E.' is thus stripped of the learned verbiage which has been accumulated to cover its nakedness, we see at once it is but a poor contrivance—a mere copy—a bungling copy of a screw—an *evasion* instead of an invention—and just such a piece of work as a tinker might produce in an attempt to rival an engineer." It will therefore be charity to suppose that the anonymous writer is as ignorant on this as on other subjects which he has lately discussed; and on the same ground, it will be charity to reverse the sentence quoted: thus, instead of attaching any meaning to the assertion that the Propeller is "just such a piece of work as a tinker might produce in an attempt to rival an engineer," let us allow this opinion to be "just what might be expected from *the tinker* who has attempted to judge of the performance of *the engineer*."

Respecting the *review* which your anonymous correspondent has copied from the London Athenæum, I need scarcely observe, that it carries no weight, unaccompanied as it is by any argument whatever in support of its allegations. I refrain from

entering into particulars regarding the springs which have been set in motion to quash the disagreeable truth told in Mr. Byrne's pamphlet, and his ungarnished statement of the *real* pretensions of those interested in the Archimedean screw. It is, however, much to be regretted that so respectable a journal as the Athenæum should prostitute its influence by becoming the mouthpiece of a stockjobbing clique—the Archimedean Screw Company—a bubble which, by the by, has since exploded.

I cannot call to my recollection having before met with a "*review*" condemnatory of a publication on a scientific subject, in which there has not been, at least, an attempt made to prove the existence of some erroneous statement or other. Yet all we find in the present instance is an allusion to "quackery" erroneously ascribed to the pamphleteer. It is difficult to conceive what *quackery* has to do with the purely mechanical and mathematical subject treated of by Mr. Byrne, and I submit to the reader whether the use made of that phrase does not prove the inability of the reviewer to grapple with the subject. As to the information which he gives his readers, that Mr. Byrne's "statements want facts," and that his "assertions want argument," the pamphlet itself will prove that information to be utterly unfounded. The reviewer here commits the very fault he deprecates. Why not *expose* the fallacy he alludes to? Why not *disprove* the accuracy of the figures and demonstrations given by Mr. Byrne in proof of the waste of power, &c. attending the application of the Archimedean screw as a propeller? But perhaps some excuse may be offered in behalf of the scribe in the Athenæum, for having undertaken to guide the opinion of its readers in this matter; very likely, he believed the tale of some disinterested stockholder in the Archimedean Screw Company; and although he may be capable of judging correctly on the productions of the novelist or the penny-a-liner, still the present subject was no doubt beyond his ken; in fact, he was out of his sphere, and on that score may be excused. Not so with your anonymous correspondent: he knows something on the subject under consideration, and therefore must have perceived the gross injustice of the review in question; and still he exultingly hands it over to your readers with his

approbation! I forbear making any comment, leaving it to your readers and the public to decide whether an individual can well place himself lower in the scale by which men's veracity and sense of justice are measured than has your anonymous correspondent by his misrepresentations of the invention to which is attached the name of

Dear Sir, yours truly,

J. ERICSSON.

Astor House, 27th September, 1841.

LIME, AND ITS COMPOUNDS.

[CONTINUED FROM PAGE 96.]

The directions for conducting the process of lime burning, given in the preceding number, embraced nearly everything of a general nature required upon that subject, and will be found applicable to every form of kiln.

In the calcination of limestones containing a large proportion of silex and alumine (clay) and metallic oxides, the fire should be managed cautiously, as these substances are apt in a high heat to fuse with the lime, and form an inert vitreous matter, having none of the sensible properties of quicklime. The term *biscuits* is applied as well to these products of a calcination pushed too far as to those so designated in another place which are but partially burned. The vitrefied pieces are worthless, but the former description of biscuits may be recalcined; it is necessary, however, to wet them before they are again put into the kiln, or their conversion into lime will be very difficult, if not impossible.

From the efficacy of the vapor of water to assist in liberating carbonic acid, M. Courtois was led to pass a current of steam into the kiln when the charge became heated, and with very good results.

The principal experiments with quicklime have been to ascertain how far it is affected by the density, purity, and crystalline structure of the natural limestone, and what changes a difference of treatment in the kiln would produce in it with reference to its use as the basis of mortar cements. From these

investigations there have arisen certain distinguishing terms, as *fat lime, meagre lime,* and *hydraulic lime,* which are universally used in the arts to denote particular varieties of lime.

Fat lime is usually very white ; in slaking it absorbs rapidly, and with a disengagement of heat, about 22 per cent of its weight of water ; increases much in bulk ; and is reduced to a dry, impalpable powder. With an excess of water, it forms a paste that incorporates easily with another substance, as sand or earth ; and if then exposed to air under a shelter, it acquires in drying, and by absorption of carbonic acid from the air, very great hardness, and even becomes susceptible of a polish : the same mixture kept in water, undisturbed, will remain soft for ages. Fat lime can only be obtained from the densest and purest limestones : those containing more than 10 per cent of foreign matters will not yield it. The best qualities are procured from the marbles ; but it is seldom these can be burned with so much economy as other carbonates of lime, owing to their granular structure, which makes it difficult to remove the lime from the kiln without great waste. It was long supposed that air-slaking was injurious to all kinds of lime : experience has shown that it is not so to fat lime intended for mortar, but, on the contrary, beneficial.

Meagre lime, in color, is commonly gray or yellow : it does not slake with so much energy as fat lime ; augments but little in bulk ; gives with water a paste not very tenacious ; hardens by exposure to the air, and does not attain any great degree of hardness in water. It is obtained from limestones that have a considerable proportion of clay, magnesia, iron, or manganese, and to the presence of these it owes its color and peculiar properties. It is injured by exposure to the air.

Hydraulic Lime.—The distinguishing feature of this lime is its property of hardening under water : in other respects it very nearly resembles meagre lime, and, like that variety, it is obtained from carbonates containing a large proportion of foreign matters, but by a different treatment in the kiln. When the proportion of clay is 20 per cent or a little more, hydraulic lime passes into a substance termed *cement,* which does not slake, and which hardens very rapidly after being made with water

into a paste, and without the addition of sand or any other material. The mass requires but a few minutes to solidify, whether it be exposed to the air or immersed in water; but under the latter circumstance its hardness becomes somewhat greater, and in time almost equals that of marble. *Roman cement*, so extensively used for cisterns, aqueducts, and other hydraulic works, is a preparation of this kind. It is obtained from a carbonate of lime, very argillaceons, compact, close in grain, hard, and tenacious.* The calcination is conducted in a perpetual kiln, with pit coal, in the same manner as that of other limestones; but great care is required in managing the fire, or the cement will fuse and become valueless.

Hydraulic lime is so necessary in all large works constructed for durability, that some of the ablest engineers and chemists of the age have devoted themselves to discover what its peculiar properties depend upon, and, if possible, place its manufacture beyond the chance of failure.

From the researches of M. Vicat, who has written one of the most important treatises extant upon lime and cement, it would appear that hydraulic lime may be obtained from all the natural carbonates which contain more than 10 per cent of clay, and that it is only necessary to regulate the fire so as to avoid calcining the clay, and leave in the limestone a certain proportion of carbonic acid, which he believes essential to the formation of an hydraulic lime. Other experiments, made several years after the publication of his treatise, led him to the farther conclusion that carbonic alone would render a lime hydraulic in some degree, and that even the purest limestones, as the marbles, if imperfectly calcined, would harden under water.

The result of a number of experiments, analytical and synthetical, cited by M. Berthier in a memoir upon mortars, is, that silex alone will form with lime a combination eminently hydraulic; that magnesia alone, or mixed with the oxides of iron and manganese, renders the lime poor, without giving it the property of solidifying under water; that alumine alone has

* An analysis of this limestone gave carb. of lime 657, carb. of magnesia 5, carb. of iron 60, carb. of manganese 19, clay (silex 180, alumine 66) 246, water 13.

The calcined product gave, upon analysis, lime 554, clay 360, oxide of iron 86.

no more efficacy than magnesia to make lime hydraulic; that silex is a principal essential to these sort of limes; that the oxides of iron and manganese, to which so important a part has been attributed, are more frequently inert; and, in short, that the means to ascertain a limestone which will yield hydraulic lime, is to be assured that it is compact, of a density sufficiently great, and that 25 to 30 per cent of its weight is clay, which can easily be determined by dissolving it in muriatic or nitric acid.

From the observations of M. Minard, it would appear that the property of becoming cement belongs to all calcareous stones; to those even which contain but a hundredth part of clay. It is sufficient that their calcination be slow, and but little advanced, so that certain limestones give at pleasure cement, which sets in a quarter of an hour, hydraulic lime, which sets in four or five days, or fat lime, which does not harden under water. The stone to produce these varieties of lime should lose respectively 8, 12, or 30 per cent of its weight. Several experiments of M. Minard led him to conclude that Roman cement owes its important properties to nothing more than subcarbonate of lime, produced by burning properly the natural carbonate.

Hydraulic cements, which have become deteriorated by exposure to the air, may be restored to their primitive energy by recalcination.

Artificial Hydraulic Lime.—The treatise of M. Vicat upon lime and cements, to which we have before alluded, has the following process for making artificial hydraulic lime:—"The operation we are about to describe is a true synthesis, reüniting in an intimate manner by the action of fire, the essential principles which are separated from hydraulic lime by analysis. It consists in allowing the lime which is to be improved to fall spontaneously to powder in a dry and cold place; afterwards to mix it, by the help of a little water, with a certain quantity of gray or brown clay, or simply with brick earth, and to make balls of this paste, which, after drying, are to be burned to the proper degree. Being master of the proportions, we may conceive that the factitious lime may receive any degree of energy

desired, equal to, or surpassing, at pleasure, the best natural lime. Very fat lime will bear 0.20 of clay to 1.00 of lime; moderately fat lime will have enough clay with 0.15; and 0.10 or even 0.06 of clay will suffice for those limes which are already somewhat hydraulic. When the proportion is forced to 0.33 or 0.40, the lime does not slake, but it pulverizes easily, and gives when tempered a paste which hardens under water very promptly."

M. Vicat, not content with his operations in the laboratory, exerted himself to have a manufactory established in the neighborhood of Paris, where, after a process indicated by him, hydraulic lime of an excellent quality is made from a mixture of chalk and clay, sufficient for most of the public works of that city.*

Gen. Treussart obtained the best results in making hydraulic lime by exposing the quicklime a month or two to the air, under shelter, before mixing it with the clay; by using clay which contained as much silex as alumine; and by dissolving a little soda, or, better still, potash, in the water with which the clay was moistened. This last agrees with some experiments of Dr. Bache upon hydraulic limes.

In the researches of M. Courtois upon factitious cements, various calcined mixtures of clay not calcareous with fat lime, resulted as follows:—Combinations containing as high as $\frac{1}{5}$ of clay possessed the properties of hydraulic lime, which we have before described; combinations containing from $\frac{1}{5}$ to $\frac{3}{5}$ of clay, made into a paste and immersed, hardened under water very promptly: mixed with an equal volume of sand, they gave a very good hydraulic mortar: mixed with fat lime at the moment of slaking, in equal proportions, a paste was obtained possessing very hydraulic properties: as the proportion of fat lime was increased, the hydraulic energy of the mixture became less. Combinations containing from $\frac{3}{5}$ to $\frac{9}{10}$ of clay, possessed the property of giving, either alone or mixed with an equal volume of sand, hydraulic mortars of different activity: united with fat

* A description of this process may be found in the *Dictionnaire Technologique*, under article *Chaux*. We deem anything more than a mere mention of it unnecessary, as it would not be found profitable except in localities where chalk abounds.

lime in the proportion of 1 part of the calcined mixture to 12 of fat lime, they formed pastes which hardened under water in fifteen days.

It would be incompatible with our design to devote farther space to this part of the subject, so many have written upon it and so well. Enough has been said to show that quality and proportions in the use of lime for cement are not unimportant matters, and that the subject has undergone a full investigation by the labors of Vicat, Berthier, Minard, and others, whose writings are easily accessible to the engineer. In Vols. XX and XXI, of the Franklin Journal, will be found translations of the works of Messrs. Treussart, Courtois, and Petot, by Col. J. G. Totten of the U. S. Engineer Corps, together with some experiments of his own upon lime and mortars.

[For the American Repertory.]

MATHEMATICAL PROBLEMS.

I am happy to perceive that among your correspondents are several highly ingenious and—in my opinion—able mathematicians. This circumstance will not only render more interesting, but also of greater practical utility, and I hope greatly extend the circulation of, your valuable journal.

The following are solutions of the several problems under the signature of " D'Alembert," in the Repertory for September.

The 1st, 2d, 3d, 4th and 5th problems involve similar principles; and before proceeding to their solution, it will be convenient to premise the following

LEMMA:

The sum of the sines of any two arcs which are n° from 30° in each direction, are equivalent to the sine of that arc which is n° from 90°. Wherefore,

In Prob. 1st, we have $\frac{a}{2}=\sin(90^\circ-n^\circ.)$
In Prob. 2d, " $a=\sin(30^\circ+n^\circ)$.
In Prob. 3d, " $a=\sin(30^\circ-n^\circ)$.
In Prob. 4th, " $a=\sin(90^\circ-n^\circ)$.
In Prob. 5th, " $\sqrt{a}=\sin(90^\circ-n^\circ.)$

From either which formulas the value of n° is very readily determined.

Problems 6th and 7th are based upon an exceedingly curious property of numbers in arithmetical progression, which is comprehended in the following

LEMMA :

In any arithmetical series wherein the first term and ratio are equal, the sum of the cubes of all the terms are equivalent to the square of the sum of the series so many times repeated as unity is contained in the first term.*

Accordingly in Prob. 6th, putting $z =$ first term or ratio, $a =$ sum, and $b =$ the sum of the cubes of all the terms, we shall have by the foregoing lemma $a^2 \times z = b$; wherefore, $\frac{b}{a^2} = z$.

Prob. 7th.—Transposing the foregoing values of a and z, we shall have by the same $a \times z^2 = b$; hence, $\frac{b}{a} = z^2$, and $\sqrt{\frac{b}{a}} = z$.

Prob. 8th.—In this is given the requisite data for solving three distinct triangles, (from either of which the circle is readily determined) viz:—1. In the triangles ABC, CDB, the angles D and A are equal, both standing on the same arc CB; accordingly, in the triangle ABC there are given the sides AC, AB, and the contained angle CAB. 2. AB$-$AC$=$AD; then in the triangle ABD there are given the sides AB, AD, and the contained angle DAB.† 3. Also, in the triangle ADC there are given AD, AC, and the angle DAC.

Prob. 9th.—Rule first, resolve the given number into any two factors, of which let d be the greater, and b the less; look in a table of natural sines for a *cos.* answering to $\left(\frac{\frac{1}{2}d - \frac{1}{2}b}{\frac{1}{2}d + \frac{1}{2}b}\right)$ the corresponding sine multiplied by $(\frac{1}{2}d + \frac{1}{2}b)$ will be the required root.

Rule 2d.—Look in the table for the sine of an arc, of which $\frac{b}{\frac{1}{2}d + \frac{1}{2}b}$ is the versed sine, the result multiplied by $\left(\frac{d+b}{2}\right)$ will be the root required.

* It might be demonstrated analytically, that in any arithmetical series wherein the first term and ratio are equivalents, any two of the following constitute data for determining the remaining parts:—1. The first term.—2. The last term.—3. The number of terms.—4. The common difference or ratio.—5. The sum of all the terms. 6. The sum of the cubes of all the terms.

† Edinburgh Encyclopedia, Art. *Analysis*.

A farther application of the principles involved in the two foregoing rules, viz. to extracting the square root by a traverse table, would be serviceable to the surveyor, and, I doubt not, interesting to the professed mathematician; accordingly, I will premise the following general

RULE:

Seek in a traverse table till against $\frac{d+b}{2}$ in the distance column you find $(\frac{1}{2}d - \frac{1}{2}b)$ in the latitude column; the corresponding difference of departure will be the required root.

Note. The foregoing rules are theoretical; and although they admit of beautiful mathematical demonstrations, yet, owing to the peculiar laws which govern trigonometrical lines, and the necessary modes of calculating them, the results cannot be considered other than nice approximations; nevertheless, the rules will in many instances be found useful.

Having solved "D'Alembert's" problems, permit me to call the attention of your mathematical correspondents to the following:—

1. Quere the result, if a heavy body were to be let fall in a hole passing from pole to pole through the centre of the earth?

2. Can a fixed star be visible simultaneously over more than one half the earth's surface? if so, a formula is required for determining the excess.

3. A method is required for determining the number of 'abundant numbers' there are less than any given abstract number a.

4. A method is required for determining the number of abundant numbers contained between any two abstract numbers a and b.

5. A method is required for determining the number of "deficient numbers" less than any given number a.

6. A method is required for determining the number of deficient numbers between any two given numbers a and b.

Note. The given number a in Prob. 5th, also a and b in Prob. 6th, are restricted to 28 symbols. J. P.

New-York, Sept. 1841.

THE KAMSCHATKA.

This beautiful steam frigate took her departure for St. Petersburgh, or rather Cronstadt, on the 29th ult. with the customary concomitants of troops of friends, good cheer, and hilarity.

The Kamschatka was constructed for the Russian government, under the superintendence of Messrs. R. & G. L. Schuyler, by whom the engines and machinery were selected and arranged and the modeling of the hull principally directed.

The hull was built by Mr. Wm. H. Brown: the boilers, engines and machinery by Messrs. H. R. Dunham & Co., and for a city famed as is New-York for excellence in ship building and manufactures, it is no faint praise to say that a craft never left her docks superior to this in finish and goodness of materials.

We have been kindly furnished from the two departments with the necessary information for preparing the following description and tabulated statement.

The Kamschatka is one of the largest steam frigates that have yet been built. She carries in all 16 guns: 12 thirty-six pounders on the gun deck, 2 sixty-four pounders and 2 ninety-six pounders on the upper deck. The latest improvements in ship building were preserved in her model, and between decks the arrangements were but little modified except so far as they were affected by the introduction of steam machinery.

There are two engines of the kind designated technically the Half Beam Engine, which turn the water-wheel shaft by cranks at right angles to each other. The cylinders are horizontal, and lie in the bottom of the ship: motion is communicated from the piston to the shaft through a bell crank, one arm of which is connected with the piston rod, and the other with the shaft. The whole of the working parts are within a connected cast iron frame, which supports them, 26 feet long and 24 feet wide, firmly secured by wrought iron bolts and stays passing in directions of the several strains, and through the entire bottom of the ship. The shafts and cranks are of wrought iron. The engines are worked by double balanced valves; and valves of the same kind are used for cutting off steam, being arranged so

easy of adjustment as to require but five minutes to set or alter them to cut off at any part of the stroke for which the cams are graduated.

The wheels combine the advantages of the double American paddle-wheel, with the buckets of one division intermediate between those of the other, and the cycloidal wheel—the buckets being divided into two parts, which are placed one above the other on opposite sides of the arms. The arms and braces are of wrought iron.

The boilers are of copper, built on the flue and tubular principle, and possessing, in an eminent degree, the advantages of both. The tubes receive the heat direct from the furnaces, and from them it passes through large flues in its passage to the chimney. The boilers are constructed for burning anthracite without the use of blowers. The space occupied by the boilers, engines and fuel, is separated from the rest of the vessel by wrought iron bulk-heads.

Diameter of cylinders,	62 in.
Length of stroke	10 ft.
Cut off	from $\frac{1}{10}$ to $\frac{7}{10}$
Average pressure of steam	5 lbs.
Vacuum, per barometer,	27 in.
Number of revolutions per minute, leaving port	10
Number of boilers	4
Space fore and aft occupied by boilers and engines	70 ft.
Diameter of water wheels	30 "
May be reefed to	28 "
Length of bucket, including both divisions of the wheel	9 ft. 6 in.
Width of bucket, { upper float 12 inches, lower do. 9 inches, }	1 ft. 9 in.
Dip of bucket	5 ft. 6 in.
Diameter of shaft journals	1 ft. 4 in.
Weight of shaft and cranks, rough	38 tons.
Do. " " " finished	30 "
Do. of water wheels	32 "
Do. of boilers, smoke pipe and breeching	90 "
Total weight of engine and boilers	450 tons.

Weight of cast iron	235	tons.
Do. of wrought iron	120	"
Do. of copper and composition	95	"
Length of keel	205	ft.
Length of ship at load water line	212	ft.
Length of upper deck	220	ft.
Breadth of beam at load water line	36	"
Depth of hold	24	"
Draft of water, loaded	16	"
Burthen	1700	tons

It was the design of the Messrs. Schuyler to make a full trial of the Kamschatka's qualities as a sailer, both by steam and wind, before she left our waters; but from the lateness of the season it had to be abandoned. Her commander was anxious to reach Cronstadt before the passage of the Baltic became hazardous.

MONTHLY RECORD.

American Institute.—The 14th Annual Fair of the American Institute will be held at Niblo's Garden, between the 11th and 22d days of October. From the number and value of the premiums offered, we may expect a more interesting exhibition than has ever before been given, particularly in the agricultural department.

Mathematical Tables.—We would call the attention of nautical men to the *Traverse Tables* in this number. They are calculated upon a new system, and although comprised in 3 pages, are more extensive than the tables in Bowditch's Navigator which occupy 60 or 70 pages.

Bitumen.—This mineral has recently been used in several of the government works for making roofs, floors, pavements, &c. and with such success as to induce the belief that it will be found peculiarly valuable for these purposes. The Engineer Department has accordingly published, for the use of the Engineer Corps, an extensive compilation upon the varieties, proper-

ties and uses of bitumen, by Lieut. H. W. Halleck, under the direction of Col. J. G. Totten, Chief Engineer.

Lieut. Halleck will please accept our thanks for the copy sent us of his valuable work.

Apollo Association.—The 8th Exhibition of this Associtiom will open at the Granite Building, corner of Broadway and Chambers street, early in the present month. In our next we shall speak of several valuable paintings in the collection.

NOTICES OF NEW PUBLICATIONS.

Mercantile Tables and Chronometrical Circles. *By* J. A. Powers, *C. E.* New-York: Published by C. S. Francis, 252 Broadway.

These tables comprise Simple Interest at 6 and 7 per cent, on any sum not exceeding $170,000 ; also the Discount at 6 and 7 per cent on any principal not exceeding $17,000, for any length of time from one day to one year ;—Compound Interest, amount of any sum not exceeding $17,000, for any number of years from 1 to 20, when improved, at the rates of 6 and 7 per cent ;—A Table, showing the day of the week on which any given day in any given month will fall from the year 1500 to 2499 of the Christian era ;—Chronometrical Circles, showing the number of days between any day in any month and any day in any other month, also the day on which any note falls due, by having the requisite data given ;—Commission Brokerage and Insurance ; also the net proceeds or balance to be remitted on any sum or account sales not exceeding $1,900,000, at every whole and half per centage between 0 and 13 ;—The Legal Value, Weight, Assay, &c. of Foreign Gold Coins ;—The Current Value of Foreign Silver Coins.

This ingenious and able work, we do not hesitate to say, is much more extensive than any ever before published. The tables are mostly constructed upon the author's newly invented system, from which circumstance they are not only elegant and compact, but also exceedingly simple and expeditious in their application. Beside which, they possess many other obvious and important advantages; for instance, the tables are equally applicable to all denominations; accordingly, the interest, discount, &c. can be obtained on a given number of dimes, cents, mills, pounds, shillings, pence, farthings, &c. with as much facility as on an equal number of dollars.—The Chronometrical Circles, for reckoning dates, constitute a most beautiful and important appendage, and in the estimate of those for whose purpose they are designed, will be found to be of the highest practical utility, and of much more value than the cost of the entire publication. Without enlarging we would observe, that this work is admirably adapted to the wants of the mercantile and business portions of the community, to whom we cheerfully recommend it, hoping it will meet with the patronage it so richly merits.

To Correspondents.—Several communications in answer to that of "*DAlembert*," in the previous number, are filed for consideration. Such as contain solutions of only one or two of the problems we must respectfully decline inserting.

EXTRACTS FROM NEW WORKS.

The following interesting history of electrical discovery forms part of a treatise on Electricity and Magnetism, by DIONYSIUS LARDNER, D.C. &c. &c. which will be issued from the London press before the close of the present year. We have been kindly furnished by the author with proof sheets of the work, from which we make these extracts.—*Ed. Am. Rep.*

HISTORICAL NOTICE OF ELECTRICAL DISCOVERY.

I. *Electro-statics.* Although it has been reserved for modern times to bring to perfection the methods of investigation pursued in physical researches, these great divisions of human knowledge have nevertheless been always progressive. If the labors of the ancients were obstructed, their advancement retarded, and their productions disfigured by fantastical theories; the facts they accumulated, the phenomena they described, and the observations they recorded, have formed a bequest of the highest value to the better disciplined inquirers and observers of later days. Astronomy, the mechanics of solid and fluid bodies, and the physics of the imponderable agents, light and heat, received severally more or less attention at an early epoch of the progress of human knowledge; and the results of ancient researches in some of these branches of science, astronomy for example, form an important element of the knowledge we now possess. Electricity, however, forms a remarkable exception to this state of progressive movement. To that particular division of physics, antiquity has contributed absolutely nothing. The vast discoveries which have accumulated respecting this extraordinary agent, by which its connection with and influence upon the whole material universe,—its relations to the phenomena of organized bodies,—the part it plays in the functions of animal and vegetable vitality,—its subservience to the uses of man as a mechanical power,—its intimate connection with the chemical constitution of material substances;—in fine, its application in almost every division of the sciences, and every department of the arts, have been severally demonstrated, are exclusively and peculiarly due to the spirit of modern research, and in a great degree to the labors of the present age.

The beginnings of science have often the appearance of chance. A felicitous accident throws a certain natural fact under the notice of an inquiring and philosophic mind. Attention is awakened and inquiry provoked. Similar phenomena under varied circumstances are eagerly sought for, and if, in the natural course of events, they do not present themselves, circumstances are designedly arranged so as to bring about their production. The seeds of science are thus sown, and soon begin to germinate. Whether such primary facts are really fortuitous, or ought not rather to be viewed as the prompting of Him, whose will is, that intellectual progression shall be incessant, it is certain that they not only give the first impetus to science, but their occasional and timely occurrence in its progress produces frequently greater effects on the

celerity of its advancement than the most exalted powers of the human mind, unsupported by such aid, have ever accomplished. It may then be imagined, that an agent so all-pervading as electricity, could scarcely have eluded notice, or failed to command attention, during a succession of ages which witnessed the growth and extension of so many other parts of natural knowledge, if any such hints were offered by ordinary phenomena. On the contrary, the class of effects in which electricity originated, were observed by and well known to the earliest philosophers of Greece. Thales, six centuries before the Christian era, was acquainted with the property of amber from which electricity derives its name;* and Theophrastus and Pliny, as well as other writers, Greek and Roman, mention the property of this and certain other substances, in virtue of which, when submitted to friction, they acquire the power to attract straws and other light bodies, as a magnet attracts iron. In the spirit which characterized the times, such effects were regarded with feelings of superstition. A soul was ascribed to amber, and it was held sacred.

Nor were these the only phenomena which presented themselves to the ancients, and afforded them a clue to the foundation of this part of physics. Various other scattered facts are recorded, which prove that Nature did not conceal her secrets with more than usual coyness in this case. The luminous appearance attending the friction of those substances which exhibit electrical effects, was observed. The Roman historians record the frequent appearance of a flame at the points of the soldiers' javelins, at the summits of the masts of ships, and sometimes even on the heads of the seamen.† The effects of the torpedo and electrical fishes are referred to by Aristotle, Galen and Oppian; and at a period less remote, Eustathius, in his commentary on the Iliad of Homer, mentions the case of Walimer, a Gothic chief, the father of Theodoric, who used to eject sparks from his body; and further refers to a certain ancient philosopher, who relates of himself that on one occasion, when changing his dress, sudden sparks were emitted from his person on drawing off his clothes, and that flames occasionally issued from him, accompanied by a crackling noise.‡

Such phenomena attracted little attention, and provoked no scientific research. Vacant wonder was the most exalted sentiment they raised, and they accordingly remained, while twenty centuries rolled away, barren and isolated facts upon the surface of human knowledge. The vein whence these precious fragments were detached, and which, as we have shown, *cropped out* sufficiently often to challenge the notice of the miner, continued unexplored and undiscovered; and its splendid treasures were reserved to reward the toil and crown the enterprise of our generation.

The work of classification and generalization was first commenced upon the phenomena of electricity by Gilbert, an English physician, in a work entitled *De Magnete*, published in the beginning of the seventeenth century. In this treatise, the substances then known to be susceptible of electrical excitement were enumerated, and several of the

* *Electron*, amber. † Cæsar de Bell. Afr. cap. vi. Liv. cap. xxxii. Plut. Vita Lys. Plin. sec. Hist. Mun. lib. ii. ‡ Eustath. in Iliad. E.

circumstances which affect the production of electrical phenomena, such as the hygrometric state of the atmosphere, were explained. Between that period and the earlier part of the last century, the science was not advanced by any capital discoveries. In that interval, however, Otto Guericke, celebrated as the inventor of the air-pump, contrived the first electrical machine. This apparatus consisted of a globe of sulphur, mounted upon a horizontal axis, from which it received a motion of rotation, by means of a common handle or winch. The operator turned this handle with one hand, while with the other he applied a cloth to the globe, the friction of which produced the electrical state.

Aided by such apparatus, this philosopher discovered that after a light substance has been attracted by, and brought into contact with, an electrified body, it will not be again attracted, but on the contrary will be repelled, by the same body; but that after it has been touched by the hand, its primitive condition is restored, and it is again attracted. He also showed, that a body becomes electric by being brought near to an electrified body without touching it; but offered no explanation of this fact, which, as will be seen hereafter, indicated one of the most important principles of electrical science.

Whether it was that his attention was altogether engrossed by the researches which he prosecuted with such splendid results, in astronomy, the higher mechanics and optics, or that facts had not yet accumulated in sufficient number and variety to impress him with a just notion of the importance of electricity as a general physical agent, Newton bestowed on it no attention. One experiment only proceeding from him is recorded, in which he shows, that when one surface of a plate of glass is electrified, the attraction will be transmitted through the glass, and will be manifested on any light substances placed on the other side of it.

In the beginning of the eighteenth century, Hawkesbee made a series of experiments on electrical light produced in rarefied air; but as no consequences were deduced from them affecting the progress of the science, we shall not further notice them. In the construction of the apparatus for producing electricity, he substituted a glass sphere for the globe of sulphur proposed by Otto Guericke. This was a considerable improvement, and yet the experimentalists who followed abandoned it, and used no more convenient apparatus than glass tubes, which were held in one hand and rubbed with the other. To this circumstance Dr. Priestley ascribes, in a great degree, the slow progress made by the immediate successors of Hawkesbee in electrical discoveries.

About the year 1730 commenced that splendid series of discoveries which has proceeded with accelerated speed to the present day, and now forms the body of electrical science. Mr. Stephen Grey, a pensioner of the Charter House, impelled by a passionate enthusiasm, engaged in a course of experimental researches, in which were developed some general principles, which produced important effects on subsequent investigations.

The most considerable discovery of Mr. Grey was, that all material substances might be reduced, in reference to electrical phenomena, to two classes, *electrics* and *non-electrics;* the former, including all bodies then supposed to be capable of electric excitation by friction; and the other, those which were incapable of it. He also discovered that non-

electrics were capable of acquiring the electric state by contact with excited electrics. As the experiments which led to these conclusions were of the highest interest, we shall here state them.

Desiring to make some experiments with an excited glass tube, he procured one about three feet and a half long, and an inch and a quarter in diameter. To keep the interior free from dust, he stopped it at the ends with corks. When this tube was excited, he happened to present one of the corks to a feather, and was surprised to observe that the feather was first attracted, and then repelled by the cork, in the way it was wont to be by the glass tube itself. He concluded from this, that the electric virtue conferred on the tube by friction passed spontaneously to the cork.

It then occurred to him to inquire whether this transmission of electricity would be made to other substances besides cork. With this view he obtained a deal rod about four inches in length, to one end of which he attached an ivory ball, and inserted the other in the cork, by which the glass tube was stopped. On exciting the tube, he found that the ivory ball attracted and repelled the feather even more vigorously than the cork. He then tried longer rods of deal; next rods of brass and iron wire, with like results. He then attached to one end of the tube a piece of common packthread, and suspended from the lower end of this thread the ivory ball and various other bodies, all of which he found capable of acquiring the electric state when the tube was excited. Experiments of this kind were made from the balconies of his house, and other elevated stations.

With a true philosophic spirit, he now determined to inquire what circumstances attending the *manner* of experimenting produced any real effect upon the results; and, first, whether the *position* or *direction* of the rods, wires, or cords, by which the electricity was transmitted from the excited tube, affected the phenomena. For this purpose he extended a piece of packthread in a horizontal direction, supporting it at different points by other pieces of similar cord, which were attached to nails driven into a wooden beam, and which were therefore in a vertical position. To one end of the horizontal cord he attached the ivory ball, and to the other he tied the end of the glass tube. On exciting the tube, he found that no electricity was transmitted to the ball, a circumstance which he rightly ascribed to its escape by the vertical cords, the nails supporting them, and the wooden beam.

Soon after this, Grey was engaged in repeating his experiments at the house of Mr. Wheeler, who was afterwards associated with him in these investigations, when that gentleman suggested that threads of silk should be used to support the horizontal line of cord instead of pieces of packthread. It does not appear that this suggestion of Wheeler proceeded from any knowledge or suspicion of the electric properties of silk; and still less does it appear that Grey was acquainted with them; for, in assenting to the proposition of Wheeler, he observed, that "silk might do better than packthread on account of its smallness, as less of the virtue would probably pass off by it than by the thickness of the hempen line which had been previously used."

They accordingly extended a packthread through a distance of about eighty feet in a horizontal direction, supporting it in that position by

threads of silk. To one end of this packthread they attached the ivory ball, and to the other the glass tube. When the latter was excited, the ball immediately became electric, as was manifested by its attraction upon metallic leaf held near it. After this, they extended their experiments to lines of packthread still longer, when the silk threads used for its support were found to be too weak, and were broken. Being under the erroneous impression that the escape of the electricity was prevented by the fineness of the silk, they now substituted for it thin brass wire, which they expected, being still smaller than the silk, would more effectually intercept the electricity; and which, from its nature, would have all the necessary strength. The experiment, however, completely failed. No electricity was conveyed to the ivory ball, the whole having escaped by the brass wire, notwithstanding its fineness. They now saw that the silk threads intercepted the electricity because they were *silk*, and not because they were *small*.

Having thus accidentally discovered the insulating property of silk, they proceeded to investigate its generalization, and found that the same property was enjoyed by resin, hair, glass, and some other substances. In fact, it soon became apparent that this property belonged in a greater or less degree to all those substances which were then known to be capable of being rendered electrical by friction, and which were denominated *electrics*.

Grey now extended his inquiry to fluids and animal bodies. Having at that time no other test of the electrical state of a body than its attraction for light substances placed on a stand under it, the application of such a test to liquids presented at first some difficulty. This was soon difficulty. This was soon surmounted by the expedient of blowing a soap-bubble from the bowl of a tobacco-pipe. The bubble was held suspended over some leaf metal, and on bringing the excited tube to the small end of the pipe, the bubble immediately became electrical.

It was in the prosecution of these experiments that he discovered that, when the electrified tube was brought near to any part of a non-electric body, without touching it, the part most remote from the tube became electrified. He thus fell upon the fact, which afterwards led to the principle of INDUCTION. The science, however, was not yet ripe for that great discovery, and Grey accordingly continued to apply the principle of inductive electricity without the most remote suspicion of the rich mine whose treasures lay beneath his feet.

In another series of experiments, Grey was also unfortunate in missing a subsequent discovery on which he just touched. He found that certain electric bodies were capable of becoming permanently excited without the previous process of attrition. He took nineteen different substances, among which were resin, gum-lac, shell-lac, sulphur, and pitch, and the remainder of which were various compounds of these. The sulphur he melted in a glass vessel, the others in a spherical iron ladle. When they became solid, and cooled, and were removed from the moulds in which they were in this manner cast, he found them to be electrified, and that, by preserving them from exposure to the air, by wrapping them in paper or wool, this electrified state continued for an indefinite time. In the case of sulphur, he found that not only the sulphur was electrical, but also the glass from which it was removed. Had

he carried these inquiries further, and looked carefully into the circumstances of the attraction exhibited by the sulphur and the glass, he could not have failed in discovering the existence of the two opposite electricities, and would probably have also found the reason why the iron ladle did not exhibit electrical signs as well as the glass. This, however, escaped him, and the honor of the discovery was reserved for a contemporary philosopher.

In his investigations respecting the power of liquids to receive electricity from excited glass, Grey exhibited, in a manner which at that period appeared striking, the attraction of the glass tube for liquids. We shall, however, pass over these and some other experiments of less importance, since they did not conduce to the development of any general principle.

Contemporary with Grey was the celebrated Dufaye, who, though not impelled by the same enthusiasm, nor exhibiting the same unwearied activity in multiplying experiments, was endowed with mental powers of a much higher order, and consequently was not slow to perceive some important consequences flowing from the experiments of Grey, which had eluded the notice of that philosopher. Dufaye, in the first place, extended the class of substances called electrics; showing that all substances whatever, except the metals and bodies in the soft or liquid state, were capable of being electrified by friction with any sort of cloth, and that, to secure the result, it was only necessary to warm the body previously. He also showed, that the property of receiving electricity by contact with an excited electric was much more general than was supposed by Grey, and that most substances exhibited that property in a greater or less degree, when supported by glass well warmed and dried. Dufaye also showed that the conducting power of the packthread used in the experiments of Grey depended on the moisture contained in it, and that the conducting power was considerably increased by wetting it. By this expedient he transmitted electricity along a cord to the distance of about 1300 feet.

It had been previously ascertained, that when any substance charged with electricity communicated the electric principle to another body near it, but not in contact with it, the electricity passed from the one body to the other in the form of a spark, accompanied by a snapping or cracking noise, like that of a slight explosion. It had also been ascertained by Grey and Wheeler, that the bodies of men and animals would become charged with electricity, if placed in the usual manner in contact with an excited glass tube, provided they were suspended by silk cords, so as to prevent the escape of the electricity. Dufaye therefore reasoned, that a man being so suspended by silk cords, the electricity imparted to his person could not escape, and being charged by the excited glass tube, sparks of fire ought to issue from his body, if any body capable of receiving the electricity were presented to it. To reduce this to the immediate test of experiment, Dufaye suspended his own person by silk lines, and being electrified, the Abbé Nollet, who assisted him in these experiments, presented his hand to his body, when immediately a spark of fire issued from the person of the one philosopher, and entered the body of the other. Although such a result had been predicted as the consequence of the arrangement, the astonishment was

not the less great at its occurrence. Nollet states that he can never forget the surprise of both Dufaye and himself when they witnessed the first explosion from the body of the former.

The celebrity of Dufay rests, however, not on his experiments, but on the sagacity which led him to evolve natural laws of a high degree of generality from his own experiments, and from those of the philosophers who preceded him. He reproduced in a more definite form the principles of attraction and subsequent repulsion, which had previously been announced by Otto Guericke. "I discovered," says Dufaye, "a very simple principle, which accounts for a great part of the irregularities, and, if I may use the term, the caprices, that seem to accompany most of the experiments in electricity." This principle was, first, that excited electrics attract all bodies in their natural state; second, that after a body is so attracted, and has touched the excited electric, then such body is repelled by the excited electric; third, that if, after being so repelled, such body touches any other, it will be again attracted, and again repelled by the excited electric, and so on.

But a discovery of a much higher order was due to Dufaye. "Chance (says he) threw in my way another principle more universal and remarkable than the preceding one; and which casts a new light upon the subject of electricity. The principle is, that there are two distinct kinds of electricity, very different from one another; one of which I shall call *vitreous* and the other *resinous* electricity. The first is that of glass, rock-crystal, precious stones, hair of animals, wool, and many other bodies. The second is that of amber, copal, gum-lac, silk thread, paper and a vast number of other substances. The characteristic of these two electricities is, that they repel themselves and attract each other. Thus a body of the vitreous electricity repels all other bodies possessed of the vitreous, and on the contrary attracts all those of the resinous electricity. The resinous also repels the resinous and attracts the vitreous. From this principle one may easily deduce the explanation of a great number of other phenomena, and it is probable that the truth will lead us to the discovery of many other things."

This was a discovery of the highest order, and in its consequences fully justified the anticipation that "it would lead to the discovery of many other things." It is the basis of the only theory of electricity which has been found sufficient to explain all the phenomena of the science, and with the subsequent hypothesis of Symmer, and the laws of attraction developed by the researches of Coulomb, it has brought the most subtle and incontrollable of all physical agents under the subjection of the most rigorous canons of mathematical calculation.

A new question now arose respecting any body which has been rendered electrical, whether by immediate excitation, or by contact with another body already excited. It was not enough to ascertain that it was electrified; but it was necessary to know with which of the two kinds of electricity it was invested. The test of this proposed by Dufaye was the same which has ever since his time been adhered to. He electrified a light substance freely suspended with a known species of electricity; say, for example, with resinous electricity. If this substance was repelled on bringing it near another electrified body, then the electricity of that body was known to be resinous; but if, on the contrary,

it was attracted, then the electricity of the other body was known to be vitreous.

Dr. Desaguliers, whose works in other parts of physical science are well known, devoted some attention to electricity from the close of the labors of Grey till the year 1742, but the researches of this philosopher contributed nothing to the extension of the science. He methodized the elements which had already accumulated, and improved in some important instances the nomenclature. He denominated all substances in which electricity may be excited *electrics per se*, and defined in a distinct manner their characters. He also first applied the term *conductor* to bodies which freely transmitted electricity, and showed that animal substances owed this property to the fluids which they contain. He however failed to discover that moisture was the conducting agent in many other bodies which at that time were used to propagate electricity to a distance.

The subject of electricity now began to attract the attention of the Germans, and the first consequence was considerable improvement in the power and efficiency of electrical apparatus. The globe of glass revolving on a horizontal axis, which had originated with Hawkesbee, but had ever since that time, greatly to the detriment of the science, been abandoned in favor of the glass tube, was now resumed by Professor Boze of Wittemburgh, who added, for the first time, the *prime conductor* to the machine. This conductor consisted of an oblong cylinder or tube, of iron or tin. It was at first supported by a man who was insulated by standing on cakes of rosin; but it was subsequently suspended by silken cords.

The method of exciting the globe or tubes hitherto generally practiced, and indeed long afterwards persevered in, was to rub them with the hand, taking care that it was dry and warm. Winkler, a professor in the university of Leipsic, substituted the more convenient expedient of a *cushion* fixed in contact with the globe, and gently pressed upon its surface by springs, or any similar means. Gordon, a Scottish Benedictine monk, who was professor of philosophy at Erfurt, abandoned the use of the *globe*, and substituted for it a *cylinder* of glass, having its geometrical axis horizontal, and supported on pivots so as to revolve on that axis. The cylinders he used were eight inches long, and four inches in diameter. Thus the electrical machine assumed a form very nearly identical with the cylindrical machines of the present day.

The effects produced by these improved and powerful apparatus are related to have been extraordinary. Various inflammable substances, such as spirits, heated oil, pitch and wax were fired. Appearances of electrical light issuing from points, and the experiment since known as the *electrical bells*, were the productions of this epoch. The spark drawn from the conductor by the finger is described as being so intense as to burst the skin, draw blood, and produce a wound. Other effects on the animal system are related, in which there is probably some exaggeration.

The year 1746 forms a remarkable epoch in the history of electricity, being signalized by the invention of the Leyden phial. The merit of this discovery is disputed, being claimed for Professor Muschenbroek, Cuneus, a native of Leyden, and Kleist, a monk of that place. Probably

all these individuals were engaged in the proceedings in which the discovery originated. Dr. Priestley, a contemporary writer, gives an account of this invention, apparently obtained by personal inquiry, of which the following is the substance.

Professor Muschenbroek and his associates having observed that electrified bodies exposed to the atmosphere speedily lost their electric virtue, which was supposed to be abstracted by the air itself, and by vapor and effluvia suspended in it, imagined that if they could surround them with any insulating substance, so as to exclude the contact of the atmosphere, they could communicate a more intense electrical power, and could preserve that power for a longer time. Water appeared one of the most convenient recipients for the electrical influence, and glass the most effectual and easy insulating envelope. It appeared therefore very obvious, that water inclosed in a glass bottle must retain the electricity given to it, and that by such means a greater charge or accumulation of electric force might be obtained than by any expedient before resorted to. In the first experiments made in conformity with these views, no remarkable results were obtained. But it happened on one occasion that the operator held the glass bottle in his right hand, while the water contained in it communicated by a wire with the prime conductor of a powerful machine. When he considered that it had received a sufficient charge, he applied his left hand to the wire to disengage it from the conductor. He was instantly struck with the convulsive shock with which electricians are now so familiar, and which has been since, and is at present, so frequently suffered from motives of curiosity or amusement.

It is curious to observe how much effects on the organs of sense depend on the previous knowledge of them, which may or may not occupy the minds of those who sustain them. Those who now think so lightly of the shock produced even by a powerful Leyden phial, would be surprised at the letter in which Muschenbroek gave Réaumer an account of the effect produced upon him by the first experiment. He states that "he felt himself struck in his arms, shoulders, and breast, so that he lost his breath, and *was two days before he recovered from the effects of the blow and the terror*." He declared "that he would not take a second shock for the whole kingdom of France."

Nor was Muschenbroek singular in this extraordinary estimate of the effects of the shock. M. Allamand, who made the experiment with a common beer glass, stated that he lost the use of his breath for some moments, and then felt so intense a pain along his right arm, that he feared permanent injury from it. Professor Winkler, of Leipsic, stated that the first time he underwent the experiment, he suffered great convulsions through his body; that it put his blood into agitation; that he feared an ardent fever, and was obliged to have recourse to cooling medicines! That he also felt a heaviness in his head, as if a stone were laid upon it. Twice it gave him a bleeding at the nose, to which he was not subject. The lady of this professor, who appears to have been as little wanting in the curiosity which is ascribed to her own, as in the courage assumed for the other sex, took the shock twice, and was rendered so weak by it that she could hardly walk. In a week, neverthe-

less, her curiosity again got the better of her discretion, and she took a third shock, which immediately produced bleeding at the nose.

No sooner were these experiments made known, than the amazement of all classes of people, of every age, sex and rank, was excited at what was regarded as "a prodigy of nature and philosophy." Philosophers everywhere repeated the experiment, but none succeeded in explaining its effects. After the first emotions of astonishment had abated, the circumstances which influenced the force of the shock were examined. Muschenbroek observed, that if the glass were wet on the outer surface the success of the experiment was impaired; and Dr. Watson proved that the force of the shock was increased by the thinness of the glass of which the bottle containing the water was made. He also observed, that the force of the charge did not depend on the power of the electrical machine by which the phial was charged. Dr. Watson also showed that the shock could be transmitted undiminished through the bodies of several men touching each other.

By further repeating and varying the experiment, Watson found that the force of the charge depended on the extent of the external surface of the glass in contact with the hand of the operator; and it occurred to Dr. Bevis that the hand might be efficient merely as a conductor of electricity, and in that case the object might be more effectually and conveniently attained by coating the exterior of the phial with sheet lead or tin-foil. This expedient was completely successful, and the phial, so far as related to its external surfaces, assumed its present form.

Another important step in the improvement of the Leyden jar was also due to the suggestion of Dr. Bevis. It appeared that the force of the charge increased with the magnitude of the jar, but not in proportion to the quantity of water it contained. It was conjectured that it might depend on the extent of the surface of glass in contact with water, and that as water was considered to play the part merely of a conductor in the experiment, metal, which was a better conductor, would be at least equally effectual. Three phials were therefore procured and filled to the usual height with shot instead of water. A metallic communication was made between the shot contained in them respectively. The result was a charge of greatly augmented force. This was, in fact, the first electric battery.

Dr. Bevis now saw that the seat of the electric influence was the surface of contact of the metal and the glass, and rightly inferred that the form of a bottle or jar was not in any way connected with the principle of the experiment. He therefore took a common pane of glass, and coating the opposite faces with tin-foil, extending on each surface within about an inch of the edge, he was able to obtain as strong a charge as from a phial having the same extent of coated surface. Dr. Watson being informed of this, coated large jars made of thin glass both on the inside and outside surface with silver leaf, extending nearly to the top of the jars, the effects of which fully corroborated the anticipations of Dr. Bevis, and established the principle that the force of the charge was in proportion to the quantity of coated surface.

The results of all these experiments led to the inference that, in the discharge of the phial, the electricity passed through the circle of conducting matter which was extended between the inside and the outside

coating of the jar. If that circle were any where interrupted by the presence of non-conducting matter, or *electrics per se* as they were then called, no discharge took place. Also, if any portion of the circle were formed of living animals, each animal sustained the shock. To carry the demonstration of this further, Dr. Watson placed, at several points in the circuit, spoons filled with spirits between the extremities of iron bars, but not in contact with them. In such cases the spirits in all the spoons were inflamed apparently at the instant of the discharge.

Many of these properties were simultaneously discovered by Mr. Wilson, who experimented in Dublin. He coated the external surface of the jar in the first experiments by plunging it in water. He also made several experiments with a view to affect by a shock one part of the human body without affecting the other parts. But the most remarkable discovery of this electrician was the *lateral* shock. He observed that a person standing near the circuit through which the shock is transmitted, would sustain a shock if he were only in contact with any part of the circuit, or even placed very near it.

Those who are conversant with the science, and aware of the important principle of induction, will see with much interest how nearly many of the philosophers engaged in these researches touched, from time to time, on that great property, and yet missed the honor of its discovery. Without it, the explication of the phenomenon of the charge and discharge of the Leyden phial was impossible. The lateral shock just adverted to, and observed by Wilson, was almost a *glaring instance* of it; but a still more striking manifestation of the theory of the Leyden phial was afforded by an experiment of Mr. Canton, who showed that if a charged phial be insulated, the internal and external coatings would give alternate sparks, and then, by continuing the process, the phial might be gradually discharged. Canton just touched on the discovery of dissimulated electricity.

While these investigations were proceeding in England, the philosophers of France were not wanting in that zeal and activity which they have always manifested for the advancement of physical science. The Abbé Nollet, M. de Monnier, and others, prosecuted similar experimental researches, and arrived at the knowledge of several of the important circumstances developed in England. Nollet showed that a phial containing rarefied air admitted of being charged as readily as one which contained water, and stated that the water in the Leyden experiment served no purpose, except to conduct the electricity to the glass.

From this time to the period at which Dr. Franklin commenced his researches, no important progress was made in the science, although at no former period were experiments on so grand a scale projected and executed; nor was public attention ever before so powerfully attracted to any scientific subject. Numerous and extensive experiments were made, both in England and France, to determine the distance through which the electric shock could be transmitted, the nature of the substances through which it could be propagated, and the rate at which it moved. At Paris, M. Nollet transmitted it through a chain of 180 soldiers; and at the convent of the Carthusians he formed a chain measuring 5400 feet, by means of iron wires extending between every two

persons, and the whole company gave a sudden spring, and sustained the shock at the same instant. But it was in England that the experiments on this subject were made on the most magnificent scale. Mr. Martin Folkes, then president of the Royal Society, Lord Charles Cavendish, Dr. Bevis, and several other fellows of the Society, formed a committee to witness these experiments, the chief direction and management of them being undertaken by Dr. Watson. A circuit was first formed by a wire carried from one side of the Thames to the other over Westminster Bridge. One extremity of this wire communicated with the interior of a charged jar; the other was held by a person on the opposite bank of the river. This person held in his other hand an iron rod, which he dipped into the river. On the other side, near the jar, stood another person, holding in one hand a wire communicating with the exterior coating of the jar, and in the other hand an iron rod. This rod he dipped into the river, when instantly the shock was received by both persons, the electric fluid having passed over the bridge, through the body of the person on the other side, through the water across the river, through the rod held by the other person, and through his body to the exterior coating of the jar. Familiar as such a fact may now appear, it is impossible to convey an adequate idea of the amazement, bordering on incredulity, with which it was at that time witnessed.

The next experiment was made at Stoke Newington, near London, where a circuit about two miles in length was formed, consisting, as in the former case, partly of water and partly of wire. In one case there were about 2800 feet of wire, and 8000 feet of water. The result was the same as in the case of the experiment at Westminster Bridge. In this case, on repeating the experiment, the rods, instead of being dipped in the water, were merely fixed in the soil at about twenty feet from the water's edge, when it was found that the shock was equally transmitted. This created a doubt whether, in the former case, the shock might not have been conveyed through the ground between the two rods, instead of passing through the water, and subsequent experiments proved that such was the case.

The same experiments were repeated at Highbury, and finally at Shooter's Hill, in August, 1747. At the latter place, the wire from the inside of the jar was 6732 feet, and that which touched the outside coating was 3868 feet long. The observers placed at the extremity of these wires were two miles distant from each other. The circuit, therefore, consisted of two miles of wire, and two miles of soil or ground, the latter being the space between the two observers. The result of the experiment proved that no observable interval elapsed between the moments at which each observer sustained the shock. In this experiment the wires were insulated by being supported on rods of baked wood.

We shall here pass over a variety of experiments made in England, France and Germany on the effects of electricity on organized bodies, and on some proposed medical applications of that agent, such researches not having led to any general principles affecting the real advancement of the science.

Passing from the analysis of the confused experimental labors of his immediate predecessors, labors which contributed so little to the development of the nature and laws of electrical phenomena, to the researches

of Franklin, is like the transition from the mists and obscurity of morning twilight to the unclouded splendor of the noon-tide sun. It was in the summer of the year 1747 that a fortuitous circumstance, happily for the progress of knowledge, first drew the attention of this truly great and good man, and (as he afterwards proved) acute philosopher, to the subject of electricity. Mr. Peter Collinson, a fellow of the Royal Society of London, and a gentleman who took much interest in scientific affairs, made a communication to the Literary Society of Philadelphia, explaining what had been recently done in England in electrical experiments, and with his letter he sent a present of one of the glass tubes then commonly used to excite electricity, with directions for its use. Previous to this time, Franklin does not appear to have ever given his attention to physical science. Nevertheless he now commenced repeating the European experiments with all the ardor of an enthusiast, and extending, varying and adapting them to the development of great general laws with all the skill and sagacity of a practised experimental philosopher. Within the brief period of four months after the arrival of the tube, he commenced a series of letters to Mr. Collinson, in which are related a body of discoveries which, for the high generality of the laws they unfolded, the surpassing beauty and clearness of the experimental demonstrations on which they were based, and their intimate connection with the uses of life, are well worthy to be put in juxtaposition with the discoveries of Newton respecting the analysis and properties of light. How different, however, was the position of these two great discoverers and benefactors of the human race! One brought to bear on the subject of his inquiry a mind early disciplined in scientific investigation, a memory stored with profound mathematical erudition, faculties rendered more acute and strong by the severe studies exacted from all aspirants to academical honor and office in the universities of the old countries, zeal awakened, emulation stimulated, and enthusiasm kindled by associates, among whom were included all that was most distinguished in the physical sciences; the other, first a tallow-chandler's apprentice, and next a poor printer's boy, unschooled, undisciplined, self-informed, having nothing to aid him but the inborn energy of his mind; separated by an ocean three thousand miles wide from the countries which alone were the seats of the sciences, and where alone those aids and encouragements derivable from the society of others engaged in like inquiries could be obtained. Such was the individual whose researches we must now briefly notice. The series of letters in which he embodied the details of his experiments, and developed the laws which resulted from them, were continued from 1747 to 1754, and were subsequently collected and published.

"Nothing," says Priestley,* "was ever written upon the subject of electricity which was more generally read and admired in all parts of Europe than these letters. There is hardly any European language into which they have not been translated, and, as if this were not sufficient to make them properly known, a translation of them has lately been made into Latin. It is not easy to say whether we are most pleased with the simplicity and perspicuity with which these letters are written, the modesty with which the author proposes every hypothesis of his

* History of Electricity, per. ix, sect. i.

own, or the noble frankness with which he relates his mistakes when they were corrected by subsequent experiments."

In the analysis of Franklin's discoveries, it is necessary to distinguish carefully fact from hypothesis, and to separate the great natural laws which he brought to light, the truth and reality of which can never be shaken, based, as they are, on innumerable observed phenomena, from the theory by which these phenomena and their laws are attempted to be explained by him, which latter, though marked by great sagacity and ingenuity, and adequate to the explication of most of the ordinary effects of electricity, has been found insufficient to represent the results of subsequent researches, and has been generally superseded by another theory, which will be noticed hereafter.

The first step made by this philosopher in the brilliant series of discoveries by which he rendered his name so memorable, was one which produced a material influence on his subsequent proceedings, since it formed the foundation of his celebrated hypothesis of positive and negative electricity, which served him as the link by which many scattered facts might be grouped and connected, and as a clue to the development of new and unobserved phenomena. To reduce to the most brief, simple and general terms the expression of the first fruit of his observations, it may be said to consist in the establishment of the general principle, that when electricity is excited by the mutual friction or attrition of any two bodies, both these bodies become electrified; and if both are insulated they will continue to be so electrified. They will, however, be in different electrical states, since, if movable, they would *attract* and not repel each other; but, nevertheless, each of them will exhibit in relation to other bodies not electrified the same properties. Thus sparks may be drawn indifferently from either, and each of them may be *de-electrized*, or discharged of their electricity, by being put in metallic communication with the ground. These general facts he proved by direct experiment.

He placed two persons, A and B, on insulating supports. In the hand of A he put a glass tube, which being rubbed by A, became electrified. This tube was then touched at every part of the rubbed surface by B; after which the same process was several times repeated, the tube being deprived of its electricity as often as it was touched by B. A third person, C, not insulated, now presented his finger on a metallic sphere to B, from whom a spark was drawn; and by repeating this, or by touching the person of B, the latter was deprived of the electricity he had received from the tube. This was no more than was expected. But on subjecting A to the same process, the very same effects were produced. It appeared, therefore, that both A and B were electrified.

Being again electrified, as before, by the friction of the tube, instead of A and B, being successively touched by C, they were made to touch each other, both remaining insulated. After this both were found to be as completely *deëlectrized* and restored to their ordinary state as when they had been touched by C.

A cork ball, suspended by a silk thread, being electrified by contact with the excited glass tube, was repelled when brought near the person of B, but it was attracted when brought near the person of A.

From these experiments it appeared the electrical states of A and B

were different. Franklin called the state of B, and consequently that of the glass tube from which he drew the electricity, *positive*, and that of A *negative*. The one was said to be *positively*, the other *negatively electrified*. The cloth with which A rubbed the glass tube was, like A, negatively electrified—it attracted the cork ball; and the glass tube, like B, was positively electrified—it repelled the cork ball.

The generality of this result was established by a great variety of experiments. In all cases it appeared, that the opposite electrical charges of the two bodies submitted to friction, or of any insulated bodies in communication with them, had the same reciprocally neutralizing power; in virtue of which, when brought into contact, or when a metallic communication was established between them, all signs of electricity would disappear.

Such is a strict statement of the facts as evolved in the experiments. The hypothesis proposed by Franklin for their explication was as follows:—All bodies in their natural state are charged with a certain quantity of electricity, in each body this quantity being of definite amount. This quantity of electricity is maintained in equilibrium upon the body by an attraction which the particles of the body have for it, and does not therefore exert any attraction for other bodies. But a body may be invested with more or less electricity than satifies its attraction. If it possess more, it is ready to give up the surplus to any body which has less, or to share it with any body in its natural state; if it have less, it is ready to take from any body in its natural state a part of its electricity, so that each will have less than their natural amount. A body having more than its natural quantity is electrified positively or *plus*, and one which has less is electrified negatively or *minus*.

When two bodies are submitted to mutual attrition and become electrified, one parts with a portion of its proper electricity, which is received by the other. The latter then has *more* than its natural amount, and is *positively* electrified; the former has *less*, and is *negatively* electrified.

In the instance above stated, when A rubs the glass tube, he loses a portion of his natural electricity, and is negatively electrified, while the tube receives what he loses, and becomes *positively* electrified. When B. touches the tube, he takes from it nearly all the electricity with which it is charged over and above its natural amount; for his body being of so much greater magnitude than the tube, the proportion which will remain on the tube will be insignificant.

If, when A rubs the tube he were not insulated, he would not be electrified, because, as fast as his body would lose its proper amount of electricity, the deficiency would be made up from the earth with which he is in free electrical communication; whereas in the former case, being insulated, this supply could not be obtained. Hence, in this theory the earth is regarded as the common reservoir of electricity, from which bodies negatively electrified receive what they want, and to which bodies positively electrified give up their surplus, except in the case in which the one or the other are insulated.

Such, in general, was the theory of Franklin; which, however, will be more fully developed hereafter.

(TO BE CONTINUED.)

MISCELLANEOUS.

FOREIGN.

Night Telegraph.—A telegraph to act by night as well as by day, has been invented by a mechanic at Perpignan. This telegraph is worked by the signals of the ordinary telegraph, only the arms are painted white, and they are placed against a black ground. At night a strong light is thrown by reflection on the arms of the telegraph, and they therefore appear against the black ground like lines of fire. A trial of this telegraph has just been made at Perpignan, in the presence of Messrs. Mathieu and Savary, of the Royal Observatory. It was found that these signals can be made as readily as with the common telegraph. In the present method of communicating by telegraph, it is requisite that the points or stations should be very much elevated, so that the arms of the apparatus may be seen against the sky; but by the black back ground contrived by the inventor, the telegraph may be placed in any situation which is sufficiently high to be seen from the communicating stations.

Improvements in making Sugar from Cane Juice.—These improvements relate to the rollers, driving wheel, and feeding apparatus of cane mills; to the application of hot water or steam to the crushed cane, to facilitate the expression of the juice; and to the construction and setting of the pans.

Three small rollers are arranged round the under part of the periphery of the main or top roller, and are caused to revolve by a cog-wheel, fastened on one end of the main roller, and taking into three smaller cog-wheels, one at the end of each of the smaller rollers, so that the cane in passing through the mill is subjected to three distinct pressures, whereby the juice will be more thoroughly expressed than it is in the ordinary mill, in which the cane undergoes only two pressures. Instead of the above arrangement, three pair of rollers may be used for the same purpose; in which case the bearings of the axes of each pair of rollers are tied together with malleable iron straps, thereby relieving the framing of a great part of the strain to which it would otherwise be subject. The juice at each pressing is thrown backwards from the canes in the opposite direction from the motion of the rollers, instead of passing onwards with the canes, as in the common mill.

The rollers with the necks or axes are cast in one piece, in place of being cast separately as usual.

The driving wheel has a groove in its periphery, and is also provided with several set-screws passing through the same. Round the wheel is a toothed ring, having a corresponding groove formed in the inside of it, and within these grooves friction brasses are placed, which being pressed into the toothed ring by the set-screws, prevent the ring from coming off the wheel, and in proportion as the set-screws force the friction brasses against the inner surface of the ring, so will be the friction holding of the ring with the wheel.

The canes are first put on an inclined plane or table, from whence they are raked on to an endless band, extended between two rollers by

which motion is communicated to it, being supported along its upper part by a number of smaller rollers, and the canes being gradually carried by the band to the mill, time is allowed for spreading them evenly. Before reaching the mill the canes pass under a small roller, the bearings of the axis of which are capable of rising and falling in slots formed in the framing, so that if too much cane passes under it the bearings will rise, and by means of connecting-rods cut off the steam from the engine that drives the machinery, and so stop the mill; the like effect is produced when the attendant neglects to supply the canes.

Just before the last pair of rollers a pipe is placed, perforated with a number of small holes, through which jets of hot water or steam are applied to the crushed canes before they pass through the rollers, in order to facilitate the expression of the juice.

In fixing the pans of the ordinary construction, it is necessary to form a rim of lead or copper round the set of pans, whereas in this improvement a portion of the outer rim is cast on each pan, so that on the pans being joined together by screws, those portions will form the entire rim, at the same time the syrup is permitted to boil over from one pan to another, at the junctions of every two pans, over the usual rims of the same.

Under each pan a shield of brickwork is formed by means of which the boiling liquid above the shielded parts will be comparatively quiet, and the scum arising from the liquid will collect there, and may be readily removed.

The sugar pans are either formed of plates of iron, tinned before being made into a pan, or when of cast iron, the tin is applied to the inner surfaces of the pans after they have been cast.

Steam Engine Furnaces.—A series of experiments on the economical effects of furnaces of different construction, and on different kinds of fuel, has been made by a committee appointed by the Society of Industry of the Grand Duchy of Hesse, and their object has been—

1. To ascertain the useful and economical results of furnaces for boilers constructed on different principles.

2. To establish the relative value of the combustibles most generally used in the country.

We do not consider it necessary to enter into the details of the experiment; we will only mention the results.

In order to decide the first question, a common boiler was set over a furnace of brick-work provided with a chimney, and this apparatus for heating was submitted to various modifications, as regarded the form and structure of the hearth as well as the disposition of the flues.

In order to resolve the second question, experimental trial was made of good dry wood chopped from the beech tree; of good coal from Roer, called *Fettschrot;* and of square pieces of turf from Greisheimer, perfectly dried, and of the heaviest kind.

The different modifications used in the construction of the furnace were the following:

I. Furnaces without flues or draught chimneys, the boiler being suspended freely above the fire.

II. A simple flue passing round the boiler, the bottom part of which

only was immediately exposed to contact with the fire burning in the grate.

III. A double flue; that is, a flue going twice round the boiler in the same direction.

IV. A stove arched in the shape of a cupola, and having an opening in the middle of the arch, which became gradually wider towards the top, and by which the heat ascended, and was communicated to the bottom of the boiler, to be afterwards conveyed by three holes, placed at regular distances, into a circular passage which surrounded the boiler; to issue thence through three similar apertures differently arranged, and which communicated with a second passage placed higher, whence the draught was at length conducted into the chimney.

V. Two half flues, that is, each of which did not extend beyond half the circumference of the division of the boiler. The fore part of the flame (on the side next the door) ascended from the stove, and was distributed half into the flue on the right, half into the flue on the left, and was finally conducted into the chimney at the point where they met.

VI. Four half flues, or two on each side the boiler (from right to left); the flame issuing from the side opposite the door entered into the lower flue, then passed half the circumference of the partition of the boiler, and entered into the upper flue, whence it was finally conducted into the chimney.

The relative effects of these different arrangements have been ascertained, both with respect to the quantity of water evaporated in the boiler, as well as that of the combustible employed; particular care being taken to keep up the same level in the boiler after each experiment.

In the following table, which contains results of the experiments, the numerals indicate the different methods of construction of the furnaces in the order in which they have been before described; the figures placed underneath indicate the relative qualities of the combustibles employed to obtain a similar result; consequently the greater amounts indicate the worst methods of employing combustibles :—

Wood	VI	V	III	II	IV	I
	63	68.8	68.69	72.19	72.23	100
Turf	VI	III	IV	V	II	I
	53	66	71	72	76	100
Coal	III	VI	II	V	IV	I
	73	76	83	85	91	100

The following are the conclusions to be deduced from the foregoing table :—

1. The fire over which the boiler was placed without flues was attended with a less advantageous use of combustible than those with flues.

2. The utility of flues is much more perceptible in fires of wood or turf than in coal fires, because the result is a saving in fuel of about $\frac{1}{4}$ to $\frac{1}{3}$ with wood, and almost of $\frac{1}{4}$ to $\frac{1}{2}$ with turf, and only of $\frac{1}{10}$ to $\frac{1}{4}$ with coal, by the addition of flues.

3. The mode of construction with four half flues (No. VI) may be considered to be generally the most advantageous. Next to this, the construction with a double flue, (No. III) which in its mode of action bears the nearest resemblance to it. With respect to the arrangements Nos. II, IV, V, the effects they produce are nearly similar.

4. The double flue (No. III) which surrounds the whole boiler, is attended with better results than the single flue (No. II); according to the same principle, four half flues (No. VI) are attended with better results than two half flues (No. 5.)

5. With the fire of wood and of turf, two half flues (No. V) have more effect than a whole flue (No. II), and four half flues (No. VI) more than two whole flues (No. III); in short, flues which encircle only half the boiler are in this case more effectual; while with a coal fire it is precisely the contrary. The cause of the difference is doubtless this: that in such combustibles as wood or turf, which blaze brightly, a retardation of the heated air, which in these half flues produces a sudden change in the direction of its motion, is more advantageous than with coal.

With respect to the calorific power of the different fuels, there results from equal weights, of turf 96, and of coal 250, when that of wood is considered equal to 100.

The great difference that is found in combustibles, with respect to their natural quality and their composition, as well as in their degrees of dryness, can scarcely admit of forming points of comparison between these latter results and any other given case. It is well known that there are turfs which from an equal weight throw out more heat than wood; but the results with respect to the different methods of constructing furnaces are more to be depended on; because in these are remarked a degree of regularity in their effects, and it is easy to account for the causes on which the differences depend. Moniteur Industriel.

Perforating Glass by Electricity.—At a late meeting of the Electrical Society, London, a communication from A. Crosse, Esq. was read "On the perforation of non-conducting substances by the mechanical action of the electric fluid." The author secured end to end, on the surface of a piece of window glass, two platinum wires, and connected their other terminations with the respective conductors of a powerful electrical machine; sparks were then passed between the two ends along the surface of the glass, but no effect was produced; the glass was then immersed in water, and, after a certain number of turns of the machine, a hole was drilled through the glass at right angles to the direction of the stream. What at first sight was remarkable is, that not unfrequently the hole commenced at the side of the glass opposite to that along which the current of sparks was passing. This strange result the author traced to the vibration of the glass beneath the action of the successive shocks, for, upon substituting plate glass, less susceptible of vibration, the hole commenced from the side along which the sparks passed. These experiments were varied in many ways; their results were illustrated by diagrams. Mr. Crosse concludes that, with proper adjustment of the apparatus, not only glass and the softer crystals, but even the diamond may be thus drilled.

Improvements in Fire Grates.—This invention applies to the furnace of the ordinary wagon boiler, and consists in so arranging the fire-bars of the ordinary fire-grate, that its upper surface is formed into elevations and depressions in the transverse line of the same. This is effected either by making the fire-bars of different heights, or by making their supporters of different heights. Beneath this fire-grate is a second grate of the ordinary construction, on which the small coal and other combustible matters that fall from the upper one are consumed, and between this grate and the upper one is a framing of tubes, the upper parts of which are perforated with a number of small holes; these tubes are supplied with boiling water from the boiler, which evaporating ascends between the bars of the upper grate, and thereby tends to keep them clean. Beneath the second grate is a third, which receives the ignited ashes and bits of cinders that fall from the second grate; and beneath this grate is the ashpit, provided with a door, through which air is admitted, so that the air entering the furnace through the ashpit door will become thoroughly heated before it reaches the upper fire-grate. At the inner end of the fire-grate rises an inclined plane, and directly above this plane, in contact with the boiler, is an arch, both of which are made of fire-bricks, the space between the plane and the arch being the passage through which the flame and smoke pass to the flues or tubes of the boiler.

The apparatus for feeding the furnace with coal consists of two hoppers, placed one above the other; the fresh coal is put into the upper hopper, and is allowed to descend through a sliding door in the bottom of the same into the lower hopper, from whence it descends through a similar sliding door into a space in front of the fire-box, where it is thoroughly dried, and is then distributed by the fireman over the upper grate by means of a scraper. Inventors' Adv.

Felted Cloth Filter.—A person at Brussels has invented a filter which appears to surpass, in the simplicity of its construction and in its reported effects, most of those hitherto brought under public notice. The filter consists of two pieces of felted cloth, several inches thick, between which a layer of powdered charcoal is placed. This is the first application of thick felted cloth for the purpose of filtration, and it is probable that it will be thus exclusively used. Filters of this kind can be cleansed with the greatest ease.

Carbonic Acid Gas Engine.—A vessel has been constructed by a company in Louisiana, to be propelled by carbonic acid gas, on the principles discovered by Tillerier and Faraday, the acid being generated in a liquid state under great pressure. The invention consists in having two large gas generators, on the same plan as that of Tillerier, which are supplied with sesqui-carbonate of soda and sulphuric acid. A few drops of the liquid carbonic acid produced by the mixture of these substances are allowed to drop alternately before and behind the pistons of an engine contrived like those of a steam-engine, and as this liquid acid is at a pressure of at least 93 atmospheres, its great expansion gives motion to the engine. By this means of propelling ships, a few tons of sesqui-carbonate of soda and sulphuric acid would be sufficient for a voyage across the Atlantic. Le Fanal.

New mode of Etching on Cylinders.—The pattern cylinder from which the pattern is to be transferred, is placed, parallel to the cylinder to be etched, upon a small shaft, which is supported by two bearings projecting from a carriage. This carriage is by means of a nut connected to a screw, which extends the whole length of the machine, being supported by journals and steps at each extremity, by the revolution of which screw the carriage is traversed along the machine from one end to the other, being held in a steady and proper position by a bed or planed surface on which it is accurately fitted. The screw is caused to revolve by means of a wheel, provided with a small handle to turn it by, being held stationary by a spring catch, when the traversing process is not proceeding. In order to traverse the pattern cylinder, the screw is made to revolve, thereby moving the carriage and pattern cylinder endways, which traversing is continued until one of the tracing points falls again upon the same part at the commencement of the pattern cylinder as the other tracer had arrived at on the other cylinder previous to the traversing. To secure the accuracy of the traverse or end movement of the pattern cylinder, a graduated scale is attached to the carriage of the tracers, and on the carriage of the pattern cylinder a pointer is placed, being on a level with the graduated scale, so that the operator can adjust the pointer accurately to the given point on the scale at each traverse, with greater certainty than he could find any particular part on the transferred pattern. Inventors' Adv.

Anecdote.—The following anecdote, related by T. A. Trollope, B.A. in his late work, "A Summer in Western France," is so exquisitely rich, that we cannot forbear giving it to the reader, even against the advice of our grave presiding genius:

"I was exceedingly amused by the precautions an old lady, who had evidently never been on board a steamboat before in her life, took to insure her safety and that of her lap-dog, whom she vigilantly compelled to share her place of security. This was immediately over the boiler. I could not conceive what induced the old soul to continue standing so long in one spot, and insisting on her dog also standing close to her. The captain offered her a seat in vain. She preferred retaining the position she had taken up; and at length my curiosity was so much excited that I determined to make an attempt to fathom the mystery. So I addressed her with some remarks on the speed of the boat, spoke of the distance to Rochefort, inquired whether she was going thither, and, on finding that she was, suggested that she would be very tired if she continued standing all the while, and offered to put up for her one of the hanging benches at the sides of the vessel. No! she was much obliged, she preferred standing. I ventured to observe that, perhaps, if she preferred standing, she might find it more agreeable to stand in the after-part of the vessel, as the vibration of the engine was much more felt where she was, and must be disagreeable to her. O, not at all! au contraire, she rather liked it. * * * I determined, however, to make one more attempt, and with this view remarked, after a pause of a few minutes, that a great many steamboats had blown up lately, and that I rather doubted the safety of this one. Upon this subject she

was perfectly at home—knew all the accidents that had been in the papers for years back; and seemed to consider it rather more in the ordinary course of things that a boat should blow up once in the course of a trip than otherwise. I began to be amazed now in earnest, and to suspect that this tremendously fire-proof old lady must be not altogether sound in her intellectuals. I just observed to her, however, that if—or rather when—the boiler did burst, we should, if we continued standing where we then were, infallibly be the first and most certain sufferers; to which she replied, with two or three gentle nods of her head and an approximation to a wink, 'Soyez tranquille! Je connais mon affaire! N'ayez pas peur! Ce n'était pas hier que je suis venue au monde! Regardez donc. Ne voyez vous pas que je suis ici en sureté? Couchez donc, Fidèle. Oui, oui! Je connais mon affaire! .... personne mieux!' added the old lady, with much self-complacency, as she pointed out to me a pipe connected with the safety-valve, on which was inscribed, in white capital letters, '*Tube de Sureté*.'"

Improvement in Gas Meters.—The object of this improvement is to keep the water in the gas-meter at its proper level. In the ordinary square frame in front of the gas-meter a pipe is placed, the upper end of which is at the proper level for the water, and at the lower end is an orifice which opens into a close chamber at one end of the square frame; this chamber is provided with a waste pipe for the egress of the superfluous water, the upper end of which is at the same level as the upper end of the other pipe, the lower end extends below the meter, and may be closed by a screw-plug. The water is first poured into the body of the gas-meter through a pipe, from thence it flows through an opening in the centre of the meter into the square frame, and there rising to the top of the pipe runs down the same into the close chamber, where it rises to the top of the waste-pipe, and runs down the same, so that it is impossible for the water to remain in the gas-meter above its proper level. Inventors' Adv.

Galvanography.—M. Robell, a professor of Munich, has recently made known a process by which to obtain copper-plates, affording impressions similar to sepia, or India-ink drawings. It is well known that the grand principle of the formation of plates by the agency of electricity is that of chemical affinity; the surface on which the deposit is to be made must be a conductor, and of this fact the Munich professor has availed himself for the production of impressions resembling drawings. Thus, on the conducting plate the figures are sketched with varnish, which forms of course a concave space in the plate about to be formed, as occupying that space, which must otherwise have been filled up by metallic deposit. Notwithstanding the interposition of foreign matter, the precipitation proceeds, though at first slowly, and the metal forms a perfect mould upon the surface presented to it; and as soon as the varnish is perfectly covered, the precipitation becomes equalized over the entire surface. The process is as follows:—Mix oxide of iron with viscous essence of turpentine, and with this compound make upon a copper or silver plate the drawing, the impression of which is to be conveyed to the plate about to be formed. The strength of the tone

will of course depend upon the quantity of the material employed. When the sketch is dry, expose the plate to the action of the electrotype, when metallic deposition will immediately take place; first, on those parts of the conducting plate which are exposed, then on those on which the sketching matter lies the thinnest, and at length will cover those parts where the touches have been the strongest. Before the last parts are covered, withdraw the plate from the apparatus; and when dry, apply a couch of graphite to those parts yet uncovered; after which let the process recommence; and when the entire surface is covered, it is then only necessary to suffer the plate to acquire a consistency adequate to meet the action of the copperplate press. When the plate is separated, wash the sketching matter off with ether, and a most accurate impression of the sketch will be presented in the new plate, which, when proved, will afford all the variety of tone, the strength or lightness of touch, with which the drawing had been treated. Art Union.

Life-preserving Rocket.—The Sheffield Iris states that an exhibition of Mr. Carte's apparatus for preserving life in shipwreck, took place in the Botanical Gardens in that town, on Monday. About 6 o'clock, Mr. Carte sent out the first rocket, which drew after it a trail of cord to the extent of nearly 125 fathoms, and fell near the flag-staff, at the western verge of the Gardens. The second rocket went a little to the right of the first, and fell at pretty near the same distance. The third fell at a distance of 200 yards; and the fourth (a more powerful one, starting at a greater elevation) went to the distance of 280 yards, falling over the Garden wall in a field of wheat. Others were afterwards sent up, and reached their destination with the greatest nicety, proving the efficiency of the apparatus for the humane object Mr. Carte has had in view in its invention. Inventors' Adv.

Remarkable Plant.—At a meeting of the Asiatic Society in June, the Secretary read a botanical description of the *Lodoicea Sechellarum*, by M. Bernard, President of the Committee of Natural History of the Sechelles Islands. This production, which has been long known under the appellation of the double sea-cocoa-nut, grows only on two small islands of the Sechelles group, lying nearly under the equator. Many centuries before the place of its growth was known, portions of this nut had been frequently carried by the oceanic currents to the Maldive Islands and the Malabar coast; and the most absurd fables were current respecting its origin and virtues. It was generally supposed to grow at the bottom of the sea; and the votaries of Vishnu devoutly believed that when that deity was churning the ocean, he broke off several of the branches from the tree, that they might float upon the surface, and be a specific for all the ills that afflict mankind. The Lodoicea attains a height of 80 or 90 feet, and is surmounted by a beautiful crown of winged and palmated leaves. The diameter of the stem varies from 12 to 15 inches; and the whole is so flexible that the tops of those trees which stand in each other's vicinity, strike against and chafe each other in a strong breeze, making an extraordinary noise. The leaves open like a fan: they are of large size, often attaining to a length of 20 feet, with a breadth of 10 and 12, and in some few cases to 30 feet in length,

including the petiole, which is of sufficient strength to support the weight of a man. The fruit is generally double, sometimes triple, and even quadruple; and with its inclosing drupe, attains a length of 13 inches, with a circumference of 3 feet, and sometimes weighs from 40 to 50 lbs. A full-grown specimen, on the Society's table, measured 20 inches in length. The immature fruit, called by the colonists "coco tendre," is easily cut with a knife, and it then affords a sweet and melting aliment, of an agreeable taste. When the fruit is ripe, it drops on the ground, and is no longer fit for food. In a few months, if not buried in the earth nor exposed to the rays of the sun, the fallen nut begins to germinate, and a new plant is formed. A remarkable circumstance connected with this tree is the length of time necessary to mature its fruit, and the long duration of its bloom. It bears only one spadix in each year, and yet has often above ten in bloom at once: it has flowers and fruits of all ages at one time. The tree grows on all kinds of soil, from the sandy shore to the arid mountain top; but the finest are found in deep gorges, on damp platforms, covered with vegetable matter. In such situations the great height and slender diameter of the stem, and the length of its enormous leaves, produce a fine effect; though, near the sea shore, its leaves, torn by the storms, and hanging in long strips, give it a desolate appearance. It is to be regretted that the tree is not cultivated, and that a practice has prevailed of cutting it down in order to get at the fruit and tender leaves. The writer of the notice, in fact, expresses his fears that the species will be ere long entirely lost. The uses of the Lodoicea are numerous. When young, its fruit is a refreshing article of food: when ripe, it furnishes oil. Its germ, when developed, is a sweet dish. The hard shell is formed into excellent vessels for drawing and carrying water, and the whole nut is used in India as a medicine. The wood is used for building, and is split open to form good water channels, and excellent palisades for fencing. Its leaves are used for thatching; and when platted, they are made into hats, bonnets, baskets, fans, and a number of tasteful works, for which the ladies of the Sechelles are celebrated. Atheneum.

Antique work of Art.—A discovery has been made in the Library of the Arsenal in Paris, of a second copy, unlettered, and in fine condition, of the celebrated print of Maso Finiguerra, representing the Assumption of the Virgin—a copy of which existed in the Bibliothèque Royale, and was considered an invaluable relic, and important to the history of the art of printing from engraved metal plates—being 400 years old.

Use of Lime in planting Trees.—A large plantation has, within the last two or three years, been formed in the neighborhood of Inverness without the loss of a single tree; and this has been achieved by a very simple process. It is merely putting a small quantity of lime in the hole with the plant: about four bushels of lime will suffice for an acre. It must be thoroughly mixed and incorporated with the mould before the plant is inserted. The effect of the lime is to push on the growth of the plant in its first and most precarious stage. New fibres begin to form and ramify from the top root; and not only is the safety of the plant insured, but its growth is advanced in double ratio. Inverness Courier.

New kind of Castor.—Between the socket of the castor and the horns is a horizontal anti-friction wheel, turning upon the pin of the castor; the upper side of the wheel works in contact with a flange on the pin of the castor, which is sunk into a recess in the bottom of the socket, and the underside of the wheel works upon the top of the horns, and supports the same by means of a semicircular projection cast on the front of them, which bears against its periphery. The horizontal anti-friction wheel is applied in a similar manner to "plate castors," the upper side of it working against the plate which is screwed to the leg of the table or other article of furniture. Inventors' Adv.

Improved Carding and Spinning Machinery.—This invention consists of a carding and spinning machine called a "filo finisher," containing all the parts requisite for carding and spinning, into which wools and hairs being received in the state of slivers of patted wool, are delivered therefrom in the state of spun wool, twist, yarn, or thread, thus performing in one machine the processes which have hitherto been performed by two, viz. the carding engine, and the mule spinning jenny, or other spinning machine.

The steel spindles, for spinning the wool after it has passed through the carding part of the machine, are placed horizontally, and have each an eye in their ends, corresponding with the interior of a tube, through which the thread passes to be twisted and wound on the bobbin. This tube is supported by a brass or tin cylinder, fixed upon the spindle by a brass or iron circular plate, and having on its end a pulley by which the spindle is caused to revolve. On the spindle is a brass or iron conductor tube, supporting the bobbin, and having a brass or tin pulley by which motion is given to it. The bobbins are made to travel upon the conductor tubes or bobbin bearers in the direction of their axes, so that each part of the surface of the bobbin may be presented to the end of the tube from which the thread runs off.

The bobbins containing the slivers of patted wool are placed in a frame at the carding end of the machine, and the wool being drawn from them by the ordinary feeders, passes over a wooden lattice-work or grating, which is divided so as to distribute equally over the surface of the great drum the wool necessary for every spindle.

The great drum, conjointly with the workers and retakers, cards the wool which is given to it by the feeders, and the flier detaches the wool from the great drum as soon as it is carded. After this, the drum presents it to the combers, which turning, lift up the wool from the drum, and then unfold upon their surfaces small ribbons of wool. These being introduced into the spindles, receive the stretching given by the reciprocating motion of the bobbins, and the twisting given by the spindles, the thread being fastened or wound upon the bobbin which is drawing it.

Ib.

Improvements in the Tanning Process.—A patent has been recently granted for the following apparatus, by which the unhairing, mastering and tanning of the various descriptions of hides and skins is said to be much expedited:

For tanning, the apparatus made use of consists of a revolving tub or

cylinder, of wood or metal, containing the tanning liquor, and having a number of longitudinal beams inside, placed so as to give an uneven motion to the liquor. The hides and skins are introduced through a door in the side of the cylinder, which is then secured with bolts or wedges.

For unhairing and mastering, either an open framework or the cylinder is used for containing the hides and skins; in which latter case, a grating is substituted for the door in the side. These processes are carried on in a pit, containing the liquors commonly used for unhairing and mastering, and the framework or cylinder being placed so that two thirds of it is always immersed in the liquor, is caused to revolve, making ten revolutions per minute during the unhairing, and two or three revolutions per minute during the mastering process.

In the tanning process a set of five or six tubs or cylinders may be used, the liquor contained in them being of different strengths. Ib.

Curious Effect of Lightning on Glass.—The Maidstone Gazette states that during a thunder storm in that neighborhood, when several haystacks were fired, and much other damage was done, one flash of lightning, after striking a chimney and the tiles of a pipe manufactory, was partially dispersed, and reflected against the dwelling house opposite, the four windows of which facing the chimney, and at about 15 or 20 feet distant, present a very singular appearance. In several panes oval blisters have been raised, like the air-bubbles seen in badly manufactured sheet glass. When first observed, they were covered with a fine dark-colored powder, which was unfortunately brushed away without being minutely examined, and there is a similar appearance inside some of the blisters. When the pipe manufactory was struck, four men at work were knocked down, and were of course dreadfully alarmed. Ib.

Medical Qualities of Sea Water.—Two very important agents, endowed with peculiar virtues in reference to the human constitution, have of late years been much commended and employed in the practice of medicine. I allude to iodine and bromine—both of which have been detected by recent analyses in sea water. Independent of these, there are other very active ingredients in sea water. The first is chloride of sodium, which exists in the proportion of 1 to 35, or in other words, a pint of sea water contains 216½ grains—that is to say, something less than half an ounce of common salt. The second is what medical men call muriate of magnesia, which is a combination of chlorine with magnesium—a salt endowed with well-marked properties on the human frame, and which constitutes one of the active ingredients of Pullna water. To complete this analysis, it should be stated that the same pint of sea water contains also 18¾ grains of Epsom salts, 11½ grains of sulphate of lime, with a very trifling quantity of carbonate of lime.

After this account it will be readily admitted that sea water is in fact a mineral water to all intents and purposes, and that we may therefore look with as much confidence for beneficial effects from its employment, whether externally or internally, provided it be judiciously recommended, as from the employment of other mineral waters—proportionate to, and in accordance with their respective chemical composition. Granville.

DESCRIPTION OF AMERICAN PATENTS

Granted from July 8th to July 30th, 1841.

Improvement in Stoves for Cooking and Heating. By ALEXANDER F. BEAN, Woodstock, Vt. July 8th.

CLAIM.—I claim the manner of constructing the swinging hearth, so that the two sections thereof may both be turned entirely back, under and behind the back plate of the stove, and so that each section of it shall have on it a plate or piece *u*, so formed that, when in place, these two pieces will cover and entirely close the openings J, situated beneath and between the vertical grate bars, and leading into the fire-chamber; by which device, when the vertical grate bars are also closed, the fire-chamber will become that of a close stove, and must receive its supply of air from without the room, in the manner set forth.

I claim the mode in which I have combined a tin reflector with my stove, by hinging the same or causing it to work upon joint pins, in such manner as that it may be turned up, and will in combination with the sunk hearth entirely inclose the opening in front of the stove, and that when turned down it will pass beneath the sunk hearth, and be entirely out of the way.

I claim the manner of constructing the vertical grate bars in front of the fire, so that they shall consist of flat plates or slats hung upon pivots, and be capable of being simultaneously and entirely closed, by bringing them into the same plane with each other, in the manner set forth.

I claim the placing of the hinged grated piece *v v*, so that it may be turned up to inclose in part the space J, when necessary, and thus to prevent the falling of coals from the fire-chamber; and which grated piece may be turned down, so as to be received within the sunken hearth.

I claim the constructing of the grate below the fire, and which supports the fuel in the fire-chamber, so that it may be raised up and throw the fuel upon the dead plate below it, for the purpose of being covered, to preserve it in a state of ignition.

I claim the manner of arranging the parts concerned in supplying air to the fuel, when the front of the stove is inclosed; said arrangement consisting of the tube or pipe E, the air-tube S, extending along the lower and hind part of the chamber of combustion, and the device by which it is governed at one end by a sliding shutter; the whole being combined and operating substantially as set forth.

I claim the manner of constructing and combining the respective parts of the air-heating apparatus, substantially as set forth; the said apparatus consisting mainly of two cylinders with a space between them, inclosing within them a spiral flue for the passage of heated air from the fire, through which flue pass a number of vertical air-tubes, which are supplied with cold air from without the apartment, as is also the space between the two inclosing cylinders, the same operating by an arrangement of parts such as is herein made known and represented; there being in the centre of said air-heater a descending flue, for conducting the smoke, &c. to the exit pipe, and an arrangement, such as herein set

forth, for allowing the heated air from the fire to pass directly to the exit pipe, without entering the spiral flue.

I claim the manner of constructing the oven above the air-heater, as set forth, so that the heated air may be passed back and forth through it when baking is to be effected, or may be made to pass directly up into distribution tubes without entering the oven; this being effected by an arrangement of parts substantially the same with that herein set forth.

Improvement in Pumps relating to the method of constructing the lower Valves and connecting the Wooden lengths where sections of the Pump are formed of Wood. By C. D. Van Allen, Petersburg, Va. July 8th.

Claim.—What I claim therein as constituting my invention, and desire to secure by letters patent, is the combining and connecting together of the wooden and metallic parts thereof by means of cast metal coupling screws or boxes, screwed into the wood, for the purpose and in the manner set forth; and I also claim the manner of constructing the lower valve; the whole being constructed and operating substantially as described.

Improvement in the Machine for cutting Wood Screws. By Farwell H. Hamilton, Schenectady, N. Y. July 8th.

Claim.—What I claim as my invention, and desire to secure by letters patent, is :—

1. The arrangement of machinery which operates the oil tube, and its combination with the machinery which gives to the spindles an opposite and alternate rotary motion, in the manner and for the purpose described.

2. The method herein described of making the cutting part of the dies with teeth, instead of thread, in combination with the lips, as above described.

This difference in the construction of the dies from all others, gives them the superiority and advantages above enumerated.

Improvement in Agricultural Machines, called the Revolving Cultivator. By George Whitlock, Crown Point, N. Y. July 10th.

Claim.—What I claim as my invention, and which I desire to secure by letters patent, is the arrangement of the side and transverse revolving harrows, operated in the manner set forth, in combination with the frame and plough, as before described.

Improvement in Bridges. By Earl Trumbull, Herkimer, N. Y. July 10th.

Claim—What I claim as my invention, and desire to secure by letters patent, is the combination of the suspension rods with the truss frames, made in sections for the purpose and in the manner specified; and in combination with these thus combined, I also claim the tie rods as specified. I also claim the particular construction of the cast-iron beams or sills, by uniting together in casting the two plates upper and lower, as exhibited by fig. E, with the diagonal bracing shown in fig. B, as described.

Improvement in Pianofortes. By LEMUEL GILBERT, Boston, Mass. July 10th.

CLAIM.—I shall claim constructing the centre block of the hammer with an arm projecting below its centre of motion, and having a regulating button adapted thereto; the same being arranged in all respects substantially in the manner and for the purposes herein above described.

I also claim the jack as herein first explained, (without a regulating button, so that the fly may abut upon or against a long strip of cloth or wash leather applied to the rear of the top of the same, thereby in a high degree preventing noise in the action of the same) in combination with a hammer, having its centre block constructed with the arm and regulating button, and in other respects as above set forth and represented in Fig. 1.

I also claim a jack having a regulating button, and arranged as described and represented in Fig. 2, in combination with a hammer whose centre block is constructed substantially as exhibited in Fig. 1 or Fig. 2, and as herein before explained and set forth.

In the above described pianoforte actions, I also claim the loading of the centre block of the hammer as above set forth, so that it may operate in the manner and for the purpose herein before described.

Improvement in Smut Machines. By HENRY A. BUCK, Fredonia, N.Y. July 10th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the combination of the revolving frame or beaters with the inner and external stationary cylinders, constructed and operating as above set forth.

Improvement in the Screw Wrench. By JAMES BRETT, Newburgh, N.Y. July 10th.

CLAIM.—What I claim as my invention, is the teeth on the slide, and their combination and connection with the teeth on the bar. I make no claim whatever as the inventor of any other part of the wrench.

Improvement in Lamps for burning Camphine, &c. By STEPHEN J. GOLD, Cornwall, Ct. July 16th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, in the above described improved lamp, is:—1. The mode of compressing the wick by means of two thin movable metallic cylindrical tubes, combined with the wick case, as herein set forth; the two cylinders or wick tubes, with the wick compressed between them, being inserted into the annular space between the two cylinders of the wick case, with a portion of said wick extending above the wick case, to allow of their being kept cool by the draft, all as herein set forth.—2. I claim, in combination with the outer cylinder of the burner and the rod supporting the button, a movable cylinder or screw, disconnected from the rod, but having a bottom plate which, when the cylinder is turned up, presses against the rod and elevates it, and allowing it when turned down to retain either by its own weight or by the action of a spring, as set forth; the whole being constructed and operating substantially as described.

Improvement in the manner of closing and opening the Key-hole of door and other Locks. By DAVID EVANS, Philadelphia, Pa. July 10th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the causing of a metallic plate to slide over and to close the key-hole of a lock, in such manner as not to require any care on the part of the person withdrawing the key, so that a key cannot be inserted until said plate is removed; which removal is to be effected by the aid of two concurring motions, by one of which the plate is unlatched or released from a catch, and by the other of which it is made to slide so as to cause a hole in said sliding plate to coincide with the key-hole; the respective parts by which these effects are produced being constructed, arranged and operating substantially as herein set forth.

Improvement in the art or process of conducting Vinous Fermentation. By CHARLES O. WOLPERS, Cincinnati, Ohio. July 16th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the method or process of conducting vinous fermentation in close vessels, by fermenting the beer or wash in a series of close vessels or vats, combined and operating in the manner set forth.

Improvement in the construction of Tobacco Presses. By ELLIOTT RICHARDSON, West River, Ann Arundel county, Md. July 16th.

CLAIM.—Having thus fully described the manner in which I construct and combine the respective parts of my press, I do not claim as my invention the actuating of the screw by the revolving of the nut; but I do claim the manner of forming and combining the nut and metallic box as set forth, in conjunction with the combining them with the headblock, by means of which arrangement the press can be conveniently worked by horse power, whilst the headblock of wood is left of such strength as to render it perfectly efficient.

I claim also, in combination with the foregoing arrangement, the employment of the studs *k k*, affixed in the manner described, for the purpose of steadying and keeping the hogsheads and the spring screw in a vertical position: a frame *j j*, and a vertical rod *i*, rising from the pressing screw, is represented in the drawing as aiding in preserving the vertical position of the screw; but in practice these have not been found necessary or useful.

Improvement in the construction of Smut Machines. By THOMAS R. BAILEY of Weybridge, and EZRA RICH of Shoreham, Addison county, Vt. July 16th.

CLAIM.—What we claim as constituting our invention, and desire to secure by letters patent, is the arranging of the staves which constitute the outer case, or stationary frustum or cylinder, so that they shall overlap each other to a small distance, and at the same time leaving a space between each contiguous stave for the passage of the air, smut and other impurities from the grain, whilst the grain itself is prevented from passing through.

We also claim the manner of constructing the inner revolving frustum

or cylinder, by forming the same of cast-iron staves, so combined as to overlap each other, and to leave a space of a fourth of an inch, more or less, between them, for the passage of air, to be supplied from without the apartment; the whole being arranged and combined together substantially in the manner herein set forth.

Improvement in Water Wheels. By CHARLES LEWIS, Syracuse, N. Y. July 16th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the manner in which I construct the buckets of my wheel, as above set forth, so as to discharge at the centre, and produce a reäction as well as a percussive effect, in combination with the stationary rim having apertures in it for admitting the water to the wheel; the whole being constructed substantially in the manner and for the purpose above described.

Improvement in the manner of constructing Reäcting Water Wheels. By NATHANIEL F. HODGES. July 16th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the so constructing the wheel as that each of its buckets shall constitute a segment of a hollow sphere, and that these shall be so arranged and combined with each other as that the openings for the discharge of water shall extend from the outer rim to the eye or shaft, and the wheel itself, thus constructed and combined, shall constitute a segment of a hollow sphere, as herein fully set forth.

Improvements in the Portable Circular Sawmill. By GEORGE PAGE, Baltimore, Md. July 16th.

CLAIM.—What I claim therein as new, and desire to secure by letters patent, is as follows: I claim the manner of affixing and guiding the circular saw, by allowing end play to its shaft, in combination with the means of guiding it by friction rollers, embracing it near its periphery, so as to leave its centre entirely unchecked laterally. I do not claim the use of friction rollers embracing and guiding the edge of a circular saw, these having been previously used for that purpose; but I limit my claim to their use in combination with a saw having free lateral play at its centre. I claim the particular manner in which I have applied said friction rollers, by attaching the pins or pivots upon which they are sustained and revolve to two plates of metal placed upon each other, and both held by the same set screws, as set forth. I claim the manner of forming a long carriage from two short sections, by coupling or uniting said sections by means of the rack rail only, as described.

Improvements in the Machine for cleansing Wool and Cotton from Burs, Seeds, and other foreign substances. By WILLIAM W. CALVERT and ALANSON CRANE, Chelmsford, Mass. July 16th.

CLAIM.—What we claim therein as constituting our invention, and desire to secure by letters patent, is the employment of a revolving fluted or channeled cylinder, like that herein represented and marked G, or of any analogous revolving apparatus, which will present in rapid

succession a number of picking or cleaning edges, to operate upon the burs, seeds, or other foreign matter contained in wool or cotton, in combination with the fine comb cylinder and the picker cylinder, or other apparatus analogous thereto, by which wool is carried up and presented to the action of the revolving fluted or channeled cylinder, as herein described.

Improvement in the manufacture of indelible Writing Ink. By Thomas J. Spear, New Orleans. July 16th.

Claim.—What I claim as my discovery, and which I desire to secure by letters patent, is the before described indelible writing ink.

Improvement in Shoemakers' Paring Knives. By Isaac S. Pendergast, Barnstead, N. H. July 16th.

Claim.—I do not claim to be the first to have constructed knives for paring the soles of shoes with fenders or guards to prevent the knife from cutting the upper leather; but what I do claim is combining with the blade of the knife a shield or cap in the manner set forth, viz. by forming the cap with a straight shank, flat on one side, that it may rest upon the blade, and inserting the end of the same into the socket by the side of the blade as described, by means of which arrangement I am enabled to give greater strength to the blade, and at the same time protect the upper leather from being injured.

Improvement in the process of Leaching Ashes for the manufacture of Potash. By Joseph H. Ward, Randolph, Ohio. July 16th.

Claim.—What I claim as my invention and desire to secure by letters patent, is the combination of the leach tub and reservoir of hot water with the boiler in which the ley is evaporated, by means of a tube or tubes for conducting steam from the boiler to the reservoir for heating the water in the same; the whole being constructed in the manner and for the purpose herein set forth.

Improvement in Machines for cutting and gathering Flax, Hemp, &c. By Richard M. Cook, Lambertsville, N. J. July 16th.

Claim.—What I claim as constituting my invention, and desire to secure by letters patent, is the combining of the revolving knife I, with the drum, the gathering piece and the endless bands, as herein described, so as to convert the said machine from one for pulling flax and hemp into one for cutting and delivering the same; the whole being constructed and operating substantially as herein set forth.

Improvement in the Machine for Cutting Crackers. By Charles P. Forbes, Baltimore, Md. July 17th.

Claim.—What I claim as my invention, and desire to secure by letters patent, is making the edge of the outside cutters project beyond the edge of the inside cutters, and have the points of the dockers on a level with the edge of the outside cutters, as herein described, so as to dock and cut the outside through, whilst the inner cutters do not cut suffi-

ciently far to separate the crackers. And I also claim the method herein described of cutting the dough by having the cutters and dockers permanent, and pressing the upper part of the belt or apron on which the dough is placed up against the cutters and dockers by means of a curved plate attached to a lever drawn up by weights and guided by hand, in the manner herein fully described.

Improvement in the Machine for cutting Sheet Metal. By ANDREW TRACY, Poughkeepsie, N. Y. July 17th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is—1. Attaching the upper rotary shear to a hinge piece, regulated by a thumb-screw, for the purpose and in the manner specified. 2. Attaching the stock of the shears to a lever revolving around the centre of the holding plates.—3. The combination of the lever and ratchet with the upper holding plate for turning the metal or glass, as herein described.

Improvement in the manner of forming Spikes and Nails. By WILLIAM BALLARD, New-York. July 17th.

CLAIM.—What I claim as constituting my invention, and desire to secure by letters patent, is the forming of spikes or nails with offsets or indentations, which offsets are without sharp or cutting edges, so that when driven they shall not injure the wood, but shall hold firmly by the collapsing of the wood upon them. I also claim the forming of the secondary head for the purpose and in the manner set forth.

Improvement in the mode of cutting the Leather for Horse Collars. By THOMAS PARKINSON, Sparta, N. Y. July 17th.

CLAIM.—What I claim as new, and desire to secure by letters patent, is the cutting of the leather which is to constitute the covering of the collar, to a pattern constructed in the manner of the two pieces represented by the figures 2 and 3 in the accompanying drawing, preserving in all variations of size the relative proportions of the respective parts, as herein shown and made known.

Improvement in the Wooden Frame Brace Bridge. By STEPHEN H. LONG, Marietta, Ga. Patented Nov. 7, 1839: Reïssued July 17th, 1841.

CLAIM.—What I claim as new therein and desire to secure by letters patent, are the following; that is to say:

1. I claim the forming of the truss-frames of bridges by connecting and combining string pieces, posts, main and counter braces, and arch braces, by the aid of gibs and keys constructed as set forth, using therewith such bolts or treenails as I may deem proper, but not intending to claim the use of bolts and treenails as making a part of my invention.

2. I claim the employment or use of the gibs and keys, formed in the manner set forth, and passing through the string pieces and into the posts near their ends, for the purpose of trussing and straining the frame generally.

3. I claim the manner of arranging the arch braces so as to diminish or to increase the camber of the truss-frames, by the employment of gibs and keys passing through those portions thereof, which constitute the lower parts of said arch braces.

4. I claim the construction and employment of a bearing or step of cast iron, furnished with lugs or tuscums, which are let into corresponding notches in the head and foot of the main braces and other posts, in the manner and for the purpose set forth.

5. I claim the combining with the truss-frame, constructed as herein set forth, the side arch braces, embracing between them the respective posts and braces over which they pass, and connected therewith, as herein shown and fully made known.

Improvement in the Ring Spinner. By DAVID HUNTER, Laurel Factory, Md. July 23d.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is the construction of the ring spinner A, when attached to the flyer rods B, in combination with the circular concave seat GH, or rollers P, in which it turns, as before described.

Improvement in the Sofa Bedstead. By JAMES MESCHUTT, New-York. July 23d.

CLAIM.—I am aware that a patent has been granted for a sofa bedstead on the principle of the cot bedstead, in which a frame hinged to the front of the sofa is employed, and I do not therefore simply claim the employment of a frame hinged to the front of the sofa; but what I do claim as my invention, and desire to secure by letters patent, is the adaptation of an extra frame to the front of the common sofa, connected by the hinges *l* to the tops of the pillars *e*, and supported at the extremities by the legs *h h*, in combination with the brace *i*, which slides through the front rail, and the extra frame and legs fold down against the pillars and front rail of the sofa, for the purposes and in the manner specified.

Improvement in Compounds for treatment of Syphilis, &c. By SILAS T. THURMAN, Lincoln, Ky. July 23d.

CLAIM.—What I claim as my discovery, and desire to secure by letters patent, is the compound formed by the above described ingredients and process, using for that purpose a smaller or greater quantity of the same ingredients to make a smaller or greater quantity of the compound.

Improvement in the construction of, Stoves or Bakers for cooking purposes. By MATHEW STEWART, jr. Philadelphia, Pa. July 23d.

CLAIM.—The fuel proposed to be generally used in this stove is the anthracite coal, although other kinds of fuel may be used. No claim is made to the combination of an oven with a furnace or heater at each end of it; but what is claimed and desired to be secured by letters patent, is the peculiar construction of the heat reflecting oven, as described, in combination with the two semicircular stoves with funnel-shaped caps, for saving fuel and cooking expeditiously, as before described.

Improvement in the construction of Measures for measuring Liquids. By JOHN S. TOUGH, Baltimore, Md. July 23d.

CLAIM.—What I claim as my improvement, and desire to secure by letters patent, is combining with the ordinary measure for liquids a funnel M, governed by a spigot or valve G, for allowing the liquid to be let off, all as set forth. And also the combining of two or more of the ordinary measures for liquids in one piece.

Improvement in the manner of mixing the Middlings with the Chops, in the process of manufacturing Flour. By ANDREW D. WORMAN. July 23d.

CLAIM.—What I claim therefore as constituting my invention, and desire to secure by letters patent, is an improvement in the process of manufacturing flour, by conducting the middlings into the trough of the elevators by means of a spout leading into it, and governing the feed by the hopper and shoe constructed in the ordinary way, so that said middlings shall become equally and intimately mixed with the flour, and will in the subsequent steps of the process be entirely, or nearly so, brought into the state of superfine flour.

Improvement in the manner of constructing Gins for ginning Cotton. By LEWIS G. STURDEVANT, Delaware, Ohio July 23d.

CLAIM.—What I claim therein as new, and desire to secure by letters patent, is the separating the cotton from the seed by the combined operation of a cylinder covered with fine teeth, formed in the manner of saw or rasp teeth, and of a beater cylinder, arranged and operating as herein set forth; the other parts of the gin being constructed in the usual manner. I also claim the forming of the toothed cylinder, by winding around it a cylindrical coil of wire, prepared and cut with teeth, as herein set forth.

Improvement in constructing the surgical instrument denominated the Speculum Ani. By JOSEPH T. PITNEY, Auburn, N. Y. July 23d.

CLAIM.—I claim as my invention the manner in which I have formed and combined the respective parts; that is to say, I claim the forming of a speculum ani with tapering or conical blades, united at their larger ends to forceps' handles, standing at a suitable angle with the blades to admit of the ready inspection of the parts; and furnished with a set screw to regulate the opening of the blades, by which combination and arrangement of its parts the instrument is rendered more effective, and more convenient in use, than such as have been heretofore made for the same purpose.

Improvement in the Cylinder Mill for granulating Corn, Powder, Bark and other substances. By INCREASE WILSON, New London, Ct. July 23d.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the peculiar manner of arranging the cylinders so as to have the cutters on each cylinder enter and run in the scores or spaces in the other cylinder, as herein described.

Improvement in Machines for cleaning Grain, &c. By SAMUEL BENTY, Boonsborough, Md. July 23d.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is the arrangement of the cylinders of beaters, Bs Cs, the one set of beaters revolving within the other set in contrary directions, in an armed perforated cylindrical case D, in combination with the fan *b*, trunk H, and gearing, arranged in the manner set forth, for separating smut, white caps, hulls, chaff and all kinds of impurities from the several kinds of grain which the machine is adapted to clean.

Improvement in the Harpoon. By WILLIAM CARSLEY, New Bedford, Mass. July 29th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the twisted form of the barbs or flukes of the harpoon.

Improvements on his patented Universal Mill for Grinding, Hulling, &c. By JAMES BOGARDUS, New-York. July 29th.

CLAIM.—I do not claim as my invention any of the separate parts of the aforesaid improvements on the Patent Universal Mill; but I do claim as my invention, and wish to secure by letters patent, in combination with the manner of placing the upper stone or plate a little off the centre of the lower stone or plate, (which I have already patented):

1. The construction and use of one or more circular grooves, in either one or in both of the stones or plates, as herein before described, or in any other manner substantially the same, to accelerate the feeding, and to produce, besides the hulling or grinding action, a cutting action like that of shears.

2. The combination of the upper shaft with the upper stone or plate, in the manner herein before described, or in any other manner substantially the same, to operate in combination with other parts herein before described, for the purposes of hulling seeds, grinding drugs, paints, dye stuffs, bread stuffs, &c. or cutting fruits, &c.

Improvement in Sawmill Dogs. By LINUS YALE, Newport, N. Y. July 29th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is not the principle of a screw, hand lever, notched wheel, or iron hand, as others of a different form have been used; but I do claim:

1. The nut in combination with the wrought-iron dog, as herein described.

2. The self-setting lever, in combination with the hand lever, notched wheel, and screw, for the purpose and in the manner specified.

Improvement in the manufacture of Buttons. By THOMAS PROSSER, Paterson, N. J. Patented July 29th: Antedated Jan. 29th, 1841.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the manufacture of buttons formed of compressed clay or other earthy materials, as set forth.

Improvement in making Door and other Knobs of all kinds of clay used Pottery, and of Porcelain. By John G. Hotchkiss, New Haven, Ct., and John A. Davenport and John W. Quincy, New-York. July 29th.

Claim.—What we claim as our invention, and desire to secure by letters patent, is the manufacturing knobs, as stated in the foregoing specification, of potters' clay, or any kind of clay used in pottery, and shaped and finished by moulding, turning, burning, and glazing, and also of porcelain.

Improvement in the machine for cutting Screws on the rails of Bedsteads. By Joel Thompson, Cynthiana, Ky. July 29th.

Claim.—The invention claimed and desired to be secured by letters patent, consists in the arrangement of the stock A, in combination with the guide apertures D^1 D^2 made of sufficient capacity to receive the body of the rail, and the guages C^1 C^2 in said stock, in the standard s^2 for determining the true position of the rail, in cutting the right and left screws thereon, as herein set forth.

Improvement in the manner of combining Springs and Levers to sustain the Body of Wagons and other Carriages. By Elihu Ring, Trumansburg, N. Y. July 29th.

Claim.—What I claim therein, and desire to secure by letters patent, is the combination with the elliptic or other springs, occupying the situation in which they are represented, the combined levers and springs F and G, so connected and arranged as to operate substantially in the manner herein set forth.

These springs and levers may be increased in number: they may be placed in an inverted position, and changed in form, without materially changing the nature and action; and I do not therefore intend to limit myself in these particulars, but to introduce any variations which I may think proper, whilst the same result is attained by means substantially the same.

Improvement in the manner of constructing and applying Bumper and Draught Springs on Railroad Cars. By Fowler M. Ray, N. York. July 29th.

Claim.—What I claim therein as new, and desire to secure by letters patent, is the combining of springs composed of straight leaves or plates of steel, in the manner set forth, with pockets covered at their sides, in such manner as that the flexure of said springs shall cause them to diminish progressively in their effective length, and consequently to increase in their power of resistance.

I claim in combination with said springs and pockets, so constructed and arranged, the employment of the curved cheek pieces to coöperate with the curved pockets when the leaves are all of one length. I claim also the substituting for said cheek pieces, and the combining with the long leaves which extend to the bottoms of the pockets, such number of shorter leaves as may be found necessary, and in the manner herein described.

Improvement in the Portable Sawmill. By JAMES C. MAYO, Columbia, Va. July 29th.

CLAIM.—What I claim therein as new, and desire to secure by letters patent, is the particular combination and arrangement of the respective parts thereof, as above set forth; that is to say, I claim the above described manner of combining the saw with the sliding frame; the crank to which the lower end of the saw is attached having its bearings in said sliding frame; and the sliding frame being made to embrace the side pieces, and being otherwise combined and arranged and actuated in the manner set forth. I am aware that a saw has been actuated directly by a crank at its lower end and has been actuated thereby, and that a saw has been made to move up towards the log by means of a sliding frame; but those have been used in combination with each other, and I therefore limit my claim to this combination, under the arrangements substantially as above described.

Improvement in Portable Firearms. By CHARLES LOUIS STANISLAS, Baron Heurteloup, subject of the King of the French. Issued July 29th, 1841: Antedated Feb. 23d, 1839, date of English patent.

CLAIM.—Firstly, the making of the large plate, shown in figs. 3 and 4 in the drawings annexed, so as to adapt it to the reception of the mechanism which moves the continuous priming; also making therein the chamber to receive the smoke or deposit caused by the ignited powder, in order that it shall not injure the different parts of the lock, which large plate also presents the peculiar characteristics of containing within itself the hole to receive the axis of the cock, the receptacle or channel for the priming, the chamber to receive the smoke, and the spitter, all within the same solid piece of metal, so that the distances between the various parts of the machinery herein described, being always fixed and invariable, the action of the parts shall not admit of any variation.

2. The making of the covered channel for confining the continuous priming between the barrel and the stock, in the stock before the lock, from which it can be drawn towards the touch-hole, and in combination therewith, the priming conducting spring, which presses the priming towards the wheel, the wheel for moving it forwards or backwards and fixing it, all as herein before described.

3. The compresser with two shields which is fastened to the lock, in the mode and for the purpose specified.

Improvement in the mode of propelling Ships, Boats, and other Vessels. By ELISHA F. ALDRICH, New-York. July 30th. Antedated Jan. 30.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the method of propelling ships, boats and other vessels by means of wheels that receive water at the centre, or any distance from the centre, and throw it out at the periphery by the action of the centrifugal force, as herein described. I also claim the mode described and set forth of constructing the wheels to be applied to vessels for the propulsion of the same; the wheels to revolve vertically or horizontally. And I also claim the mode of placing the wheels nearly or quite as low as the bottom of the vessel, to revolve within cases attached to the outside of the same, as described.

LIST OF ENGLISH PATENTS

GRANTED BETWEEN THE 28TH OF JUNE AND THE 28TH OF JULY, 1841.

John Chater, of the town of Nottingham, machine maker, and Richard Gray, of the same place, lace manufacturer, for improvements in machinery for the purpose of making lace and other fabrics, traversed, looped or woven. June 26; six months.

Willoughby Methley and Thomas Charles Methley, of Frith-street, Soho, ironmongers, for improvements in machinery for raising, lowering, and moving bodies or weights. (Being a communication.) June 26; six months.

Moses Poole, of Lincoln's Inn, gentleman, for improvements in producing and applying heat. (Being a communication.) June 26; six months.

William Losh, of Little Benton, Northumberland, esquire, for improvements in the manufacture of railway wheels. June 26; six months.

Nathaniel Benjamin, of Camberwell, gentleman, for improvements in the manufacture of type. (Being a communication.) June 28; six months.

William Knight, of Durham-street, Strand, gentleman, for an indicator for registering the number of passengers using an omnibus or other passenger vehicles. June 28; six months.

Christopher Nickels, of York-road, Lambeth, gentleman, for improvements in the manufacture of mattresses, cushions, paddings, or stuffings; and in carpets, rugs, or other napped fabrics. June 28; six months.

William Thomas Berger, of Upper Homerton, gentleman, for improvements in the manufacture of starch. June 28; six months.

Thomas Marchell, of Soho-square, surgeon, for improvements in raising and conveying water and other fluids. June 28; six months.

George Henry Phipps, of Deptford, engineer, for improvements in the construction of wheels for railway and other carriages. July 2; six months.

Thomas Hagen, of Kensington, brewer, for an improved bagatelle board. July 7; six months.

George Onions, of High-street, Shoreditch, engineer, for improved wheels and rails for railroad purposes. July 7; six months.

Robert Mallet, of Dublin, engineer, for certain improvements in protecting cast and wrought iron, and steel, and other metals, from corrosion and oxidation; and in preventing the fouling of iron ships, or ships sheathed with iron, or other ships or iron buoys, in fresh or sea water. July 7; six months.

William Edward Newton, of Chancery-lane, civil engineer, for certain improvements in the manufacture of fuel. (Being a communication.) July 7; six months.

Thomas Fuller, of Bath, coachmaker, for certain improvements in retarding the progress of carriages under certain circumstances. July 7; six months.

Andrew McNab of Paisley, North Britain, engineer, for an improvement or improvements in the making or construction of meters or apparatus for measuring water or other fluids. July 7; six months.

Charles Wheatstone, of Conduit-street, gentleman, for improvements in producing, regulating, and applying electric currents. July 7; six months.

John Steward, of Wolverhampton, esquire, for certain improvements in the construction of pianofortes. July 7; six months.

Thomas Young, of Queen-street, London, merchant, for improvements in lamps. July 9; six months.

Charles Payne, of South Lambeth, chemist, for improvements in preserving vegetable matters where metallic and earthy solutions are employed. July 9; six months.

William Henry Phillips, of Manchester-street, Manchester-square, civil engineer, and David Hichinbotham, of the same place, gentleman, for certain improvements in the construction of chimneys, flues and air-tubes, with the stoves and other apparatus connected therewith, for the purpose of preventing the escape of smoke into apartments, and for warming and ventilating buildings. July 13; six months.

Benjamin Beale, of East Greenwich, engineer, for certain improvements in engines to be worked by steam, water, gas, or vapors. July 13; six months.

Moses Poole, of Lincoln's Inn, gentleman, for improvements of steam baths and other baths. (Being a communication.) July 13; six months.

Miles Berry, of Chancery-lane, civil engineer, for improvements in the construction or locks, latches, or such kind of fastenings for doors and gates, and other purposes to which they may be applicable. (Being a communication.) July 14; six months.

Thomas Peckston, of Arundel-street, Strand, bachelor of arts, and Philip Le Capelain, of the same place, coppersmith, for certain improvements in meters for measuring gas and other aëriform fluids. July 15; six months.

Andrew Smith, of Belper, Derby, engineer, for certain improvements in the arrangement and construction of engines, to be worked by the force of steam or other fluids; which improved engines are also applicable to the raising of water and other liquids. July 21; six months.

John McBride, manager of the Nursery Spinning Mills, Hutchisontown, Glasgow, for certain improvements in the machinery and apparatus for dressing and weaving cotton, silk, flax, wool, and other fibrous substances. July 21; four months.

John White Welch, of Austin-Friars, merchant, for an improved reverberatory furnace to be used in the smelting of copper ore, or other ores which are or may be smelted in reverberatory furnaces. July 21; six months.

Frederic Theodore Philippi, of Belfield-hall, calico printer, for certain improvements in the production of sal ammoniac, and in the purification of gas for illuminations. (Being a communication.) July 21; six months.

William Ward Andrews, of Wolverhampton, ironmonger, for an improved coffee pot. July 21; six months.

William Newton, of Chancery-lane, civil engineer, for certain improvements in machinery for making pins and pin-nails. (Being a communication.) July 28; six months.

Anthony Bernhard Von Rathen, of Kingston-upon-Hull, engineer, for improvements in high-pressure and other steam-boilers, combined with a new mode or principle of supplying them with water. July 28; six months.

Anthony Bernhard Von Rathen, of Kingston-upon-Hull, engineer, for a new method or methods (called by the inventor, "the United Stationary and Locomotive System") of propelling locomotive carriages on railroads and common roads, and vessels on rivers and canals, by the application of a power produced or obtained by means of machinery and apparatus unconnected with the carriages and vessels to be propelled. July 28; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND FROM THE 22D OF JUNE TO THE 22D OF JULY, 1841.

William Ryder, of Bolton, Lancaster, roller and spindle maker, for certain improved apparatus for forging, drawing, moulding or forming shafts, spindles, rollers, bolts, and various other like articles. Sealed June 23, 1841.

John McBride, manager of the Nursery Spinning and Weaving Mills, Hutchisontown, Glasgow, for certain improvements in the machinery and apparatus for dressing and weaving of cotton, silk, flax, wool, and other fibrous substances. Sealed June 25, 1841.

Andrew Kurtz, of Liverpool, Lancaster, manufacturing chemist, for certain improvements in the construction of furnaces. Sealed June 25, 1841.

Thomas Young, of Queen-street, London, merchant, for improvements in lamps. Sealed June 28, 1841.

William Newton, 66 Chancery-lane, Middlesex, civil engineer, for certain improvements in machinery or apparatus for picking and cleaning cotton and wool. Sealed June 29, 1841. (Being a communication from abroad.)

Morris West Ruthven, of Rotherham, York, engineer, for a new mode of increasing the power of certain media when acted upon by rotary fans or other similar apparatus. Sealed June 30, 1841.

Anthony Bernhard Von Rathen, of the borough of Kingston-upon-Hull, engineer, for certain improvements in fire-grates, and in parts connected therewith, for furnaces for heating fluids. Sealed July 8, 1841.

John Swindells, of Manchester, Lancaster, manufacturing chemist, for certain improvements in the manufacture of artificial stone, cement, stucco, and other similar compositions. Sealed July 9, 1841.

John Rangeley, of Camberwell, gentleman, for improvements in the construction of railways, and in the means of applying power to propelling carriages and machinery. Sealed July 15, 1841.